The selection and progress of young mining employees in the National Coal Board with special reference to the use of the Industrial Training Research Unit (Cambridge) Job Disposition Questionnaire.

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Master of Philosophy

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ABSTRACT

J. Gripton - Abstract of Thesis

The selection and progress of young mining employees in the National Coal Board, with special reference to the use of the Industrial Training Research Unit (Cambridge) Job Disposition Questionnaire.

This thesis is concerned with a project to find a valid form of selection in the recruitment of young trainees for the N.C.B. It describes an attempt to establish the predictive validity of two tests devised by the Industrial Training Research Unit (Cambridge): one is an occupational interest inventory called the Job Disposition Questionnaire and the other is a special aptitude test called the Trainability Test.

The design and completion of the J.D.Q. study was the responsibility of the writer who was also one of the team who designed the N.C.B. Trainability Test and throughout the whole study acted as liaison with the I.T.R.U. The structure and procedures of the N.C.B. were a major influence in the design, methodology and outcome of the project.

The J.D.Q. is based on finding a statistically proven "job profile" of likes and dislikes of the present successful incumbents of the job to compare with those of potential recruits. Thus the validation of the J.D.Q. consisted of successfully establishing the mining profiles, using them to score the J.D.Q. performance of recruits and then recording absence and supervisors' assessments of their performance over an eighteen month period to compare with their J.D.Q. scores.

The Trainability Test is a job-specific test, designed around the essential elements of that job. This part of the study consisted of designing and staging a test, giving it to pre-selected recruits and, as before, monitoring their progress.

No statistically significant correlations were found between tests and job progress scores but there was an observable match between test scores and supervisors' assessments for the J.D.Q.

These findings are partly confirmed in two other industrial studies where no empirical correlations were found but one showed a similar positive trend on their J.D.Q. study.

The difficulties of sustaining a long study, relying on people in many different locations, were well illustrated as were also the limitations associated with some of the chosen criteria.

The results were sufficiently encouraging to suggest setting up a second stage of the study to assess the participants now that they have more job experience; and the results from the external studies point to a need to continue with the work on special aptitude testing.

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INTRODUCTION

This project is concerned with an assessment of the selection and progress of young mining employees in the National Coal Board, with special reference to the use of the Industrial Training Research Unit (Cambridge) Job Disposition Questionnaire and Trainability Test.

The present method of selection for the N.C.B. consists of written application, two written tests of English and Mathematics and an interview. Those successful applicants who have been selected as prospective apprentices are then given two more written tests of Electrical and Mechanical Comprehension. Those who are finally selected are then employed for a probationary period of six months.

Because of the lack of job opportunities throughout industry generally, the number of applicants to the N.C.B. over recent years has increased enormously. At the same time the trend in the N.C.B. has been to limit recruitment and any wrong selection represents not only a waste of company resources but the loss of a job opportunity for some other youngster. Under these circumstances the wastage of 123 out of 3559 (3.45%) in the year 1982/83 and 76 from a reduced total of 2083 (3.64%) employed in 1983/84, is undesirable.

A review of the selection methods was prompted through contact with the I.T.R.U. who have developed several selection tests of which, it was suggested, the Job Disposition Questionnaire might be of use in our selection process.

The J.D.Q. is a type of self-report inventory - a multiple choice questionnaire, containing forty nine questions on personal preferences, under the four main subjects of Physical Environment, Social Environment, Work Content and Work Method.
It can be used to identify "job profiles" corresponding to particular occupations and a successful applicant would be expected to obtain a high score of answers which match that job profile. It could be said to be concerned with the aspect of Job Expectation on the part of the applicant which has only been covered previously in the N.C.B. by the not insignificant question of whether the applicants come from a mining family.

During preliminary discussions about the J.D.Q. another test was recommended - the Trainability Test. This is a practical test and in application it involves designing an activity which represents the actual job for which the test will be used to select. It is a job specific test and has already been applied quite successfully in other manual industries.

This writer is employed in the role of Employment Officer attached to the Headquarters Manpower and Training Branch of the Industrial Relations Department. Amongst other functions, my branch has a responsibility for recruitment and selection practices for our industrial workforce throughout the coalfields. It was in an effort to update these practices that I was given sole responsibility for designing and carrying through the J.D.Q. project to completion and was one of a team of three involved in designing and administering the Trainability Test.

CHAPTER TWO

CHAPTER TWO

DEVELOPMENT OF INTEREST INVENTORIES

Self-report inventories have developed over the years, their constituent parts both of concept and design coming from many different sources.

It was the English biologist Sir Francis Galton who was primarily responsible for launching the testing movement through his investigations on heredity towards the end of the last century (Anastasi 1982). He also adapted a number of statistical techniques to facilitate the analysis of the test results. This work was continued by a student of his – Karl Pearson.

Multiple choice and other 'objective' item types were first introduced by Arthur S. Otis in an unpublished intelligence test designed for group testing, which he handed over to the Army for use in World War I.

The prototype of the personality questionnaire or self-report inventory was the Personal Data Sheet developed by Woodall to identify seriously neurotic men during World War I (Dubois 1970: Symond 1931: Goldberg 1971). Some subsequent tests concentrated on narrow areas of behaviour or on more distinctly social responses while a later development still was the contribution of questionnaire type tests for quantifying the expression of interests and attitudes.

The earlier interest inventories were mostly designed to assess individual interests in different fields of work. More recent ones reflect certain major changes pertaining to an emphasis on self-exploration, so that there are now instruments available for the individual to study their own test results and relate them to occupational information and other data about personal qualifications and experience.

A second change concerns the measurement of interests where there is more emphasis on expanding the career options open to individuals. Thus the interest inventories are being used to acquaint the individual with suitable occupations that they might not otherwise have considered.

The Strong-Campbell Interest Inventory represents the 1974 revision of the Strong Vocational Interest Blank, the construction of which was first formulated by E.K. Strong in 1919/20 (Fryer 1931: Campbell 1971). Strong found that different groups of professional people showed consistent differences from other groups in what they said they liked and disliked, extending to facets of life beyond their job. It thus proved feasible to prepare an inventory that explored an individual's interests and thereby to determine how closely their interests resembled those of persons successfully engaged in particular occupations. In a systematic programme carried out over many years, norms for different occupational groups were provided.

The S.V.I.B. introduced two principal procedures in the measurement of occupational items, namely the respondents like or dislike for a variety of specific activities, objects or types of persons that they encountered in daily living and the empirical keying of responses for different occupations.

While the S.V.I.B. is one of the oldest inventories, Anastasi (1982) chooses the Jackson Vocational Interest Survey as one of the newest and uses it to illustrate the development of interest inventories. The J.D.Q. used in this project has been applied to a variety of industries and the results have been developed into a package for use by the Careers Guidance Service, called JOBMATCH, which closely resembles the J.V.I.S.

Comparing old and new Strong focuses on specific occupations, both in item selection and normative interpretation, while the Jackson utilises broad interest areas in both item development and its scoring system. In the Strong the large majority of items are independantly marked - like, indifferent, dislike - by the respondent; in the Jackson all items are of the forced choice type. In its construction the Jackson reflects the current, more strongly based, theory approach to test construction as well as methodological advances made possible by the advent of high speed computers (Jackson 1977).

The J.V.I.S. measures two types of dimensions - one defined in terms of work roles and the other of work styles. Work roles pertain to what a person does on a job and some are closely associated with a particular occupation or type of occupation. Work styles refer to a working environment in which a certain kind of behaviour is expected. The choice of dimensions to be measured was guided by published research on the psychology of work, on factor analysis and rational classification of vocational interest items. Definition of items were refined by reference to the dictionary of Occupational Titles and, from a pool of 3000 items, the final form of the J.V.I.S. contains 34 scales covering 26 work roles and 8 work styles.

Jobmatch consists of the Job Disposition Questionnaire, an answer sheet, a portfolio of 40 job profiles and a book of corresponding job descriptions with information references. The Jobmatch inventory was designed to be applicable to both male and female respondents under 30 years of age and the job groups included were arrived at after consulting the CCDOT classification of semi-skilled and unskilled occupations. In choosing the items on the final version of the Questionnaire high face validity, with reference to the jobs for which it was designed to select, was an important consideration.

Standard score norms for each occupation were computed by comparison with the scores of a normative sample of the general working population. These were then reproduced in the form of stencils to represent job profiles.

The respondent uses the answer sheet which is in fact, the base chart on which to fit the job profile stencils. They can compare their own answers with the profiles, arrive at their own scores and compare them with the required job scores.
The appropriate job descriptions can then be referred to along with a narrative description of the normative preferences, derived from the J.D.Q. item wording.

The development of a profile and job description for the National Coal Board, which is included in Jobmatch, provided the basis for this project.

CHAPTER THREE

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DEVELOPMENT OF SPECIAL APTITUDE TESTS

In the early days of the testing movement, the main concern was with intelligence but it was soon recognised that intelligence tests were limited in their coverage of abilities. Special aptitude tests were designed in an effort to fill the gaps and amongst the first of these were mechanical aptitude tests. A large scale investigation of mechanical aptitude at the University of Minnesota, completed in 1930 by Donald G. Paterson produced three tests - the Minnesota Spatial Relations Test, the Minnesota Assembly Test and the Minnesota Paper Form Board - which are still being used today.

The goal of facilitating the selection process led to the development of test batteries, for example the General Aptitude Test Battery which was developed by the United States Employment Service. This set of nine aptitude tests covers general intelligence, verbal ability, numerical ability, spatial ability, form perception, clerical perception, motor coordination, finger dexterity and manual dexterity.

On the premise that the same pattern of essential aptitudes often characterises a number of related jobs, a portfolio of twenty two standard Occupational Ability Patterns, obtained from the GATB, is used to compare with an individual's response pattern. These standard patterns concentrate on the 'pure' elements of the jobs so that they can be used in as wide a range of situations as possible - the GATB covers five hundred jobs - but in doing so it is inevitable that they become less relevant to any specific job (Tyler 1963).

The I.T.R.U. claim that this is so in most aptitude tests. They argue the example of "manual dexterity" saying that many jobs require some kind of manual dexterity: those of sewing machinists, garage mechanics, plasterers, electronic assemblers, typists: and yet most of the tests involve similar types of manipulative tasks commonly requiring the applicant to select and place components in holes or slots of the correct shape (I.T.R.U. 1978).

Anastasi (1982) states that "the simple psychometric fact that test validity must be ascertained for specific uses of the test, has been long familiar." Further, that "for several decades the prevalent opinion in personnel psychology was that selection tests should undergo full scale validation against local criteria of job performance." Practical problems can interfere with this process though; there may not be enough existing, reliable criterion measures; there may not be enough employees performing the jobs in question to provide an adequate sample and anyway, present employees are always pre-selected - the rejected applicants cannot be included.

Interest came to be focused more on content validation of personnel selection tests. One procedure used for content validation is the Probationary Period - when successful applicants selected by the tests are employed on the job but on a probationary contract. This is already used in the N.C.B., and will continue to be used, but it does incur costs of employment and training which we are seeking at least to reduce.

Another method is to use a Job Sample to select. Here the test is part of the work to be performed on the job, the task and conditions being uniform for all those tested.

A third method is Simulation, which reproduces the functions performed on the job. Simulation and Job Sample are quite close in concept and indeed the Trainability Test, though falling into the job sample category, allows simulation if danger could arise from applicants performing part of the actual job.

The first step towards establishing test validity depends on a thorough and systematic job analysis (McCormick 1979). An effective job analysis should concentrate on those aspects of performance that differentiate most sharply between the better and the poorer workers. In the book "Aptitude Testing" Hull (1928) stressed the importance of these differentiating aspects of job performance which he called "critical part-activities". Later this concept was re-emphasised by Flanagan (1949:1950) under the name of "critical requirements" which he used in his Critical Incident technique. This technique involves the supervisor in keeping a record of specific instances of such behaviours over a certain period of time.

The focus on critical job requirements led to the development of the Job Element method for constructing tests and demonstrating their content validity. Much work was done on this by Primoff and his associates at the U.S. Office of Personnel Management. In work done on this side of the Atlantic, Alec Rodger too has argued the need to base analysis of jobs on the study and comparison of people who have proved suitable or unsuitable in performing them (Rodger 1955: Rodger & Cavanagh 1962).

That is the concept on which the Trainability Test is based. In developing a test the I.T.R.U. insist that interviews should be held with supervisors, job instructors and workers of varying degrees of experience and job success. Firm advice is given to concentrate the interviews on questions about what differentiates a poor worker from a good one. From these interviews a "critical list" of differentiating activities is compiled and the task for the test is designed to incorporate as many of these items as possible.

CHAPTER FOUR

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RESEARCH DESIGN

The selection process is founded on the hypothesis that the variables tested for at the time of selection do affect job performance afterwards.
To select for any given job, job family or total organisation, we must identify the characteristics or variables that influence performance (Guion 1975).

The art of selection long ago reached the stage of measuring to a useful degree the abilities and aptitudes needed to learn or perform a job competently and achieving good correlations between selection procedures and performance criteria (Frisby et al 1959: McMahon 1962). The returns for further efforts in this direction is likely to be limited but we still have a long way to go in tackling the area of personal values, attitudes and needs that keeps an individual interested, motivated and satisfied with his work (Clarke Downs & Mottram 1980).

While the selection process cannot assume all the responsibility for fitting the person to the job, it is more likely to facilitate the emergence of employees who are both satisfactory and satisfied if personal needs are taken into account as well as potential to acquire skills: "Capacities and inclinations; abilities and interests" (Rodger & Cavanagh 1962). Often, insufficient use is made of an individual's capacity for making decisions on his or her own suitability for a job if given the right information (Downs et al 1973).

Personnel selection is all too often looked on as a unilateral decision making process on the part of the selector; a view which inevitably reduces the emphasis on "feelings" and focuses on more quantifiable factors (Clarke et al 1980).

The research began then with a model of the psychological determinants of behaviour to establish possible performance variables :-

Behaviour = Function of ability + Specific aptitude
+ Specific skills + Motivation + Values
+ Interests

The project was directed towards :-

1. Identifying which variables were already tested in the current selection process.
2. Introducing tests for the variables not covered and administering them to applicants already selected by the established procedures.
3. Monitoring job progress of the successful applicants to compare with their performance on the selection tests.

In the N.C.B. the objective of selection is to satisfactorily place juvenile recruits - under eighteen years of age - in different work disciplines which, because of the associated formal qualifications, are accepted as requiring different academic abilities.

The selection groups are - Electrical apprentices and Mechanical apprentices, both of which are associated with the national craft apprenticeship schemes - Mining apprentices, who follow a course which is exclusive to the N.C.B. and is intended to develop our first line supervisors - and Mining trainees, who attend technical school but mainly undergo practical training.

In our present selection process, the variable of Ability is equated with academic ability and it is considered that the written test papers deal with this aspect. The test papers were specially devised by a working party from the N.C.B. who were advised by the University of Edinburgh.

The variables of motivation, interests and values are considered at interviews held by staff in each Coalfield Area Training Office. All the recruits for an Area are interviewed by the same team of people.

The specific aptitudes and skills can only be tested in a practical way, it is thought, during the six months probation period. The probation is applicable to both employer and employee so that during this time juveniles can change groups on recommendation by colliery staff, they can be dismissed and, of course, some leave voluntarily.

The only part of our selection procedure which could be said to be standard throughout the N.C.B. is the written testing - all Areas use these tests which are administered to large groups in classroom situations at Training Centres. The human factor, at least, causes variation in the remainder and it became clear that any standard test which purported to measure any of the other factors might usefully augment the established procedures.

The introduction and guide for users of the J.D.Q. (Clarke & Hartston 1979) says that "the Job Disposition Questionnaire is a technique designed to indicate the jobs or work areas for which an individual is well disposed and to steer him clear of those where he will be less happy."

The J.D.Q. is then a self-interest inventory designed to measure interests and, to a degree, indicates both motivation and values relevant to the work situation.

Another test devised and pioneered by the I.T.R.U. which has proved successful in other manual industries is the "Trainability Test". This test is designed to measure specific aptitudes and specific skills.

It was decided that both the J.D.Q. and the Trainability Test might add other dimensions to our present procedures and should be tested for their effectiveness in selecting for the National Coal Board.

Method

There are two generally accepted methods of validating tests for personnel selection. One of these is the "present employee" method, consisting of testing present employees and correlating the test results with an appropriate criterion of job success.

The other, the "follow up" method, consists of testing new employees at the time of hiring, filing the test results and, at a later date, determining the relationship between the test results obtained at the time of hiring and the criterion measures of the employees after they have had some experience in the job. A testing programme should make use of both measures if it is to yield maximum benefit (Tiffin & McCormick 1966).

The J.D.Q. already involves both methods in the course of its administration while the Trainability Test involves lengthy consultation with present employees to establish the test content before the "follow up" method is applied. Thus the tests themselves dictated the methods to be used in the research programme.

CHAPTER FIVE

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TEST PRINCIPLES

The objective evaluation of tests involves, primarily, the determination of the reliability and the validity of the test in specified situations.

As used in psychometrics reliability always means consistency, while validity concerns the degree to which the test actually measures what it purports to measure (Anastasi 1982).

Reliability

Reliability can be explained by asking how accurately or how consistently does a test measure whatever it does measure (Tyler 1963).

Traditionally, reliability has been defined as consistency of measurement - referring to the consistency of scores obtained by the same person when re-examined with the same test on different occasions. This indicates the extent to which individual differences in test scores are attributable to true differences in the characteristics under consideration and the extent to which they are due to chance errors.

In 1949 Thorndike described reasons affecting an individual's test performance - some of which were inherent in the test, some stemmed from the person taking the test and some from the environment in which the test was administered.

The first two groups of reasons are identified by using the test-retest method. In developing the test the I.T.R.U. have already established the reliability of the J.D.Q. using the test-retest method with 91 schoolchildren at an interval of two weeks. All showed a tendency to change their responses to some of the questions. A fairly consistent level of 25% changed responses was recorded - a normal occurrence in interest questionnaires with teenagers (I.T.R.U. 1982). The scores on the profiles however remained quite stable. The levels of retest reliability on profile scores, using a Spearman rank correlation coefficient, ranged from 0.62 to 0.88 (all better than 0.005 level of significance), with male profiles proving more stable than female profiles.

To pursue this further was considered to be both unnecessary and inappropriate to our study because both tests set a precondition that any applicants should be quite new to the industry and a retest implied a time lapse during which some experience would be gained. It was also considered to be impractical in terms of arranging for the applicants to take the tests on two separate occasions.

However, the one source of possible error variance which we could try to eliminate concerned the test environment, including the people administering and measuring the test.

For the degree of correspondence between scores assigned by different observers, Cattell (1957) offered the term "conspect reliability". One of the tests to be used, the Trainability Test, included a subjective assessment - the ability of the assessor to differentiate subjectively between trainees being the principle on which the test is founded. However, a rating scale to give a standard guide to the assessment is included as part of the test package and, for this project, it was anticipated that the same person would administer the test to all the trainees.

For both the tests though it was necessary to ensure that they were administered in a standard way - with the same introductory words, in the same environment or similar type of environment and always in the first week of employment.

Validity

Fundamentally, all procedures for determining test validity are concerned with the relationship between performance on the test and other independently observable facts about the behaviour characteristics under observation (Anastasi 1982).

The Technical Recommendations for Psychological Tests and Diagnostic Techniques (A.P.A. et al 1954) referred to four aspects of validity - predictive, concurrent, content and construct validities. Each of these four terms refers to the process of investigation through which the accuracy of inferences to be derived from test scores may be evaluated (Cronbach 1971).

Predictive and concurrent validation are used to evaluate inferences about the relationship of a test score to a criterion, while content and construct validities are more concerned with the intrinsic meaning of test scores - they could be referred to as descriptive validities (Guion 1965). However, the common thread underlying all four could be said to be that validity is concerned with how relevant test scores are to something else and that validity is represented by a correlation between the test and that something else - whether it be the whole domain of possible situations sampled by the test, the behaviour to be predicted, the related characteristics or some hypothetically pure measure of the construct being measured (Guion 1965).

Content Validity

If it can be accepted that a test is simply a standard sample of some kind of behaviour, then content validation involves the systematic examination of the test to determine whether it covers a representative sample of the behaviour to be measured. Content validity is built into a test from the outset through the choice of appropriate items.

In the J.D.Q. the forty nine items of the final version were arrived at after rigorous selection from a large initial pool and are thought to be applicable, in principle, to most aspects of any industrial occupation.

The Trainability Test is a practical test involving training the applicant in part of an actual job, using some of the real machinery or tools. The decision about which piece of work should figure in the test is arrived at after consultation with present employees, supervisors and management about the essential practical elements of the job. As such then it is considered to have high content validity.

Even so this satisfactory representation of the total job was not necessarily contributive to the total validity of the test for the N.C.B. It might be that items included there, although part of the job, are not predictive of future performance in mining.

Face Validity

Another aspect considered in choosing the tests to be tried was face validity. When a test has the appearance of measuring factors germane to the job it is said to have face validity (Siegel 1969). Such an appearance of validity is generally regarded as a desirable characteristic in industrial tests. Such tests look meaningful and therefore facilitate acceptance of the testing programme by both management and applicants.

For the J.D.Q. test a high face validity is claimed by the I.T.R.U. This is demonstrated by using the items that emerge from the statistical production of a job profile. In general, the item words do appear to give a good description of the job when taken directly from the questionnaire. (Appendix I gives the J.D.Q. description of an underground mineworker)

The Trainability Test, again, uses an actual part of the job for which it is being used to select and so has high face validity too.

In this general area of appearance, S. Juin and E.J. Koening (1982) argue the case for "contingency validity" in forced-choice questions. They state that the randomised technique of putting statements into forced-choice item pairs is a major flaw in the Jackson Vocational Interest Survey. The introduction of contingency validity is advocated in the construction of matched statements into forced choices so that paired statements relate to each other with one theme. This condition was met in the forced-choice J.D.Q. by each question having item choices which are variants concerning one particular job condition. (See Appendix II for the Job Disposition Questionnaire.)

Criterion-related Validity

Criterion-related validation procedures indicate the effectiveness of a test in predicting an individual's behaviour in specified situations. For this purpose performance on the test is checked against a criterion - a direct and independent measure of that which the test is designed to predict. So criterion-related validity was appropriate to our study of the tests.

The A.P.A. Test Standards (1974) differentiate between predictive and concurrent validity on the basis of time relation between criterion and test. Of the two types Siegel (1969) says that predictive validity is perhaps the more convincing for personnel selection. To demonstrate it the test must be administered to job applicants who are then hired regardless of their test score. The scores are kept until some subsequent time when a measure of job performance becomes available to be used as a criterion. The test scores are then correlated with this criterion, thereby indicating the power of the test to predict subsequent performance. As this was already the chosen procedure, it only remained to decide upon which criteria to use for the study.

CHAPTER SIX

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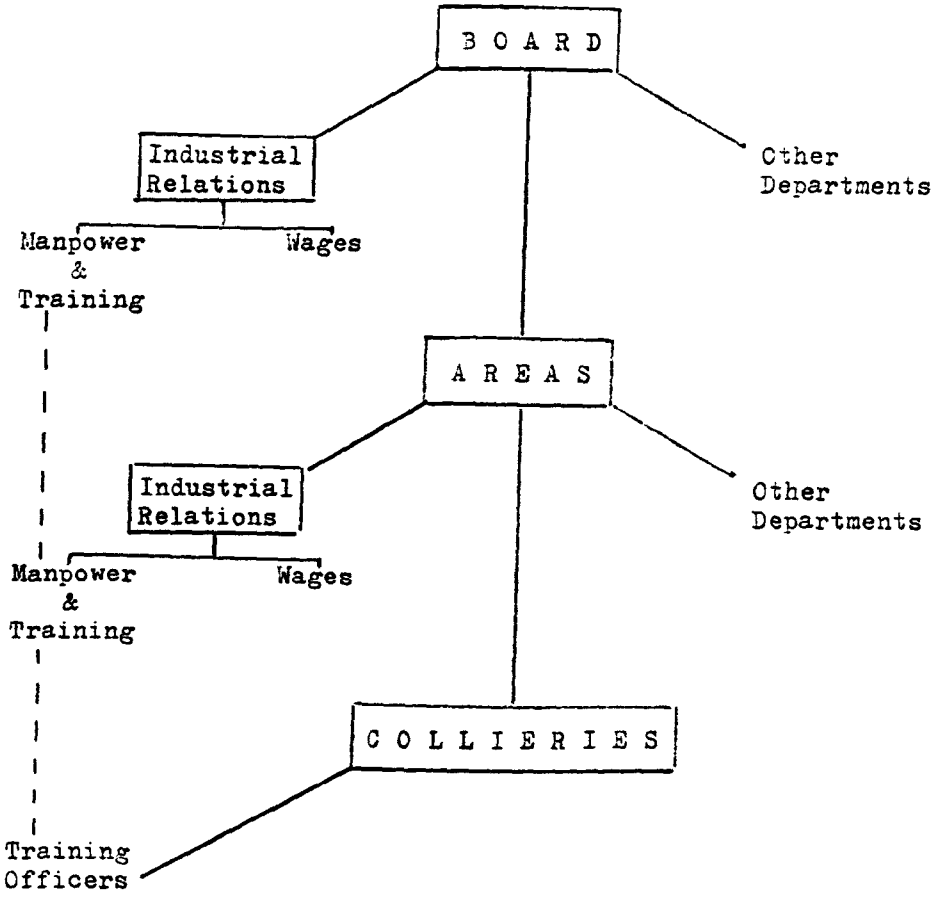
PROCEDURES

Cooperation

The two tests, the J.D.Q. and the Trainability Test, are quite different from each other - the former is a pencil and paper test while the latter is a pracical test; the J.D.Q. is ready to use wherever it is suitable, the Trainability Test is job specific and the activity involved must be designed according to the job for which it selects. Thus the practical procedures were different for each test. However, it was essential for the success of both tests to gain the necessary cooperation for their administration.

The N.C.B. has three levels of management - the Board, Areas and Collieries. It is a "staff and line" type of organisation. Policy formulated by the Board at Headquarters is passed down the line to Area Directors who are directly accountable to the Board. Area Directors in turn hold Colliery Managers to account. At Headquarters and Area levels there are different departments whose function is to collect the information on which the Board formulates policy and then, to aid and observe the application of those policies.

National Coal Board Organisation Structure



The diagram above attempts to illustrate the structure of the National Coal Board.

It was in the role of providing information which might affect the Recruitment Policy that the project was proposed by the Manpower and Training Branch at Headquarters level.

Non-production activities tend to have a lower priority in this production-based industry. Also, inherent in this type of organisation, a degree of autonomy is exercised at each level. To ensure the successful completion of the project then it was essential to gain the full approval of all who might be involved at each stage of the proceedings.

First of all, the Director of the Manpower and Training Branch - my own branch - gained approval for the project from the Departmental Director General of Industrial Relations at Headquarters.

Once this was obtained I was made responsible for pursuing the proposed J.D.Q. project: to plan the procedures, to gain and sustain the cooperation of all those necessary, to carry the project through to completion and to collect and analyse all the follow up data.

My first step was to present a paper at a meeting of Area Branch Heads of Manpower and Training. The project was explained to them and, having gained their approval in principle, several matters concerning the administration of the test were discussed. These people in turn informed their Departmental Heads. Having gained these preliminary approvals, the project could proceed.

Timing

If successful, the tests would be used for selection before applicants have had any contact with collieries. For the project, where it was proposed to use pre-selected recruits, the nearest equivalent time would be in the first week of employment. All new recruits to the N.C.B. spend at least their first week of employment undergoing off-the-job training at Area Training Centres, each centre taking all the recruits from its own Area. This bringing together of the recruits in a few locations, plus the fact that the starting date for the intake of juvenile recruits differs with each Area, would make it possible for one person to administer the tests for the study to the participants on their first day of employment with the N.C.B. and before they had been in contact with collieries.

Sample Selection

The project required two different samples for the administration of the J.D.Q. and one for the Trainability Test. The first distribution of the J.D.Q. to present employees who met certain conditions set by the I.T.R.U., indicated the use of quota sampling. For the second use of the Questionnaire with newly appointed trainees, the degree of cooperation required from coalfield staff dictated the use of cluster samples taken where staff had volunteered their assistance.

The Trainability Test also used a cluster sample from one Area. This for reasons of cost and the availability of facilities to design this practical test.

Criteria for Measuring Progress

One other question was common to both tests and that was about the criteria to be used as a measure of job progress - to compare with test performance.

In deciding on the criteria it was always necessary to bear in mind that progress would be monitored for at least eighteen months; that with nearly fifty different colliery locations involved the only feasible way was for the progress reports to be provided by the colliery staff; that the provision of reports at a suggested rate of one every three months was an activity over and above their normal work load; and that no direct authority was held over them.

Absence

It is well accepted in the mining industry that absence is a prime measure of an employee's discontent. To identify the cause a little more accurately absence is classified as voluntary, sick or accidental (being that resulting from a reportable work accident) and is so recorded by the colliery time-keepers. Absence is always recorded at collieries and records are kept for five years. If the project report procedure proved to be unacceptable, it would always be possible to check on absence at a later date from colliery records.

Absence then was the first and obvious choice for a criterion measure - voluntary absence as a direct measure of discontent, accidental absence as a possible measure of the lack of physical coordination required and sick absence as a possible indicator of a lack of physical stamina for the job.

General Progress

A colliery procedure which helped to decide on the next criterion is that of Colliery Training Officers providing quarterly reports on all juvenile employees i.e. under eighteen years of age. These reports include a subjective assessment of progress based on personal knowledge of the juvenile and backed up by reports from his training supervisors. This is seen as a great responsibility for the Training Officer because training is designed in discrete sections and a trainee must be wholly competent on one section before he can move on to the next. In mining competence equates with personal physical safety which is, literally, of vital importance. So, although purely subjective, the personal observations on which these reports are based were seen as bona fide measures to be used as one of our criteria. A five point scale was designed for use in assessing this general progress. An odd number scale with a mid-point was chosen to avoid creating any resistance to providing the reports through having to make a choice in a close decision. The points on the scale were identified by word descriptions - very good, good, average, below average and poor.

Activities

It was also considered that the number of different activities experienced during the report period would indicate the ability of the trainee to learn about mining. However, this would be governed by the amount of time the trainee spent at the colliery as opposed to the time spent at Further Education establishments. This proportion varies over the academic year and between disciplines.

Report Form

The criteria decided upon were then incorporated in the design of a pro forma to assist the Training Officers in making their reports and to keep the reports in a standard format. Finally, it was considered both useful and tactful to leave a space at the foot of the report for any Training Officer to add his own comments. The Report Form is included as Appendix III.

Literature Search

Once the basic design of the project had been decided upon a quite extensive literature search was undertaken in an effort to find reports of other similar industrial studies which would be of help in refining the proposals or in conducting the study.

A computer search through the Lockheed account in the U.S.A. gave access to the data bases in the Management Contents file, the ABI/Info file produced by Data Courier and the Education Resources Information Centre (ERIC) file. At a later date, when the Dialindex - the Dialog indexing system used to identify data bases carrying relevant terms - was introduced, an additional search was made of the Economic Abstracts file.

The search was made for papers carrying titles that included the words:- Jobmatch, Coal Industry, Coal Mining, Manual Worker, Blue Collar Worker, Selection, Personnel Selection and Selection Test. One journal paper was found which was concerned with the use of a system coincidentally called Jobmatch by Citibank and which also used job profiles, but to demonstrate equitable selection rather than prediction of performance.

The Anbar Abstracts going back to 1970 indicated several papers relevant to the development of both Jobmatch and Trainability Testing but again nothing concerned with testing predictive validity in the industrial situation. Personnel Management and the Business Periodical Index served to confirm this. The Research Index similarly could not provide any appropriate subject.

It seems that the majority of the published work on the subject of industrial selection testing appears on the other side of the Atlantic. However, although the interest in such studies appeared to have reached a peak in the mid-70s, the 8th Edition of the Mental Measurements Year Book (1978) had a description by John O. Crites of the S.V.I.B. which dates back to the 1920s. The description read - "The S.V.I.B. is the paragon of applied behaviour measures, widely acclaimed as the bellwether of career counselling and personnel selection."

In the Psychological Abstracts and the Mental Measurements Year Books there were an overwhelming number of papers to do with every aspect in the validation of psychological tests in general and selection tests in particular, but nothing could be found specifically concerning long-term industrial validation studies which was considered to be of any practical help.

CHAPTER SEVEN

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JOB DISPOSITION QUESTIONNAIRE

Introduction

The J.D.Q. is intended as a measure of job interest rather than of ability. It was designed to be used in vocational guidance to ensure that the individuals choose occupations in which they can function effectively and contentedly. The questions in it are not related to any particular job - they are more basic, referring rather to the respondents' likes and dislikes which can then be related to specific jobs (I.T.R.U. 1982).

The I.T.R.U. state that people working in specific jobs tend to have a characteristic response pattern to the J.D.Q. By comparing the responses of a job group with those of the general population norm, items chosen significantly more often by respondents than by the population as a whole can be identified. These items taken together form the job profile.
Once established, the profile can be used as a guide to selection by identifying those applicants whose response pattern to the J.D.Q. most closely matches the profile.

Initially, the N.C.B. were approached by the I.T.R.U. to participate in the production of their vocational guidance package by providing a mining profile to add to their portfolio of occupational profiles. The N.C.B. agreed to participate but requested that, if a mining profile was established, an attempt should be made to identify different profiles for our recruitment selection groups i.e. electrical apprentices, mechanical apprentices and mining apprentices.

The administration of the J.D.Q. consisted of three stages :-

1. Distribution of the questionnaire for completion by present employees.

2. Analysis of the results by the I.T.R.U. to establish the profiles

3. Administration of J.D.Q. to selected juveniles.

Initial Distribution

The I.T.R.U. required that the J.D.Q. should be distributed to "successful" employees, under thirty years of age and who had been in post for at least two years. The test is so well founded that a sample of only fifty present employees was considered quite large enough to provide a profile - if one existed. The I.T.R.U. contended that the standard deviation of scores within job groups was very low. However, for the N.C.B. other factors had to be considered.

First of all, if successful the profiles would be introduced throughout the Board and it would enhance the test's credibility if all Areas were included in establishing these profiles. This would mean a postal distribution of questionnaires with no guarantee that all would be returned.

Secondly, the I.T.R.U. were looking for a profile to represent the general "Underground Mineworker" and it was felt that a general mining profile should be made up of all the different underground disciplines of electrician, mechanic and miner, with miner further divided into coalface worker and haulage man i.e. those who transport equipment and materials in the underground environment.

Thirdly, an analysis would be made to find any significant differences which would justify having separate profiles for each of the juvenile recruitment selection groups described earlier. These included mining apprentices - our officials or first line supervisors. The sample needed then to include some established young officials, that is those who have come through our internal apprenticeship scheme rather than those who have become officials after gaining some job experience and then taking a full time study course.

This all indicated the use of quota sampling for the first distribution of the questionnaire to present employees. The plan for this stage of the project had already been discussed with Area Heads of Training who had helped in the decision about quota controls and agreed to distribute the questionnaires. The danger of quota sampling in being unable to evaluate a possible sampling error would be avoided because the "sample units" making up each quota were to be current employees, known to us and identifiable. Falsification of returns was unlikely and so it could be anticipated that this method would provide an acceptable survey of a type now widely used commercially, for instance in market research.

Twenty questionnaires were sent to each Area Head with reminders that they should be distributed to those employees under thirty years of age who had been in post for at least two years and who were considered to be "good workers". The respondents could be chosen from different collieries within their Area but should be distributed among the job disciplines wherever possible in the proportions of one mechanic, one electrician and four face workers to every eight haulage men, these being the approximate proportions of the workforce represented by these disciplines. If this was not feasible then to have the fourteen questionnaires completed by anyone who met the stipulated conditions.
The instruction about the young officials subsample was - to include as many as possible who fulfilled the required conditions.

This yielded 238 questionnaires, completed by the following groups :-

Group	Number	Approx. % of Total U/ground Workforce
Young Officials	69	12%
Face workers	31	24%
Haulage Workers	52	54%
Mechanics	44	6%
Electricians	42	4%
Total	238	100%

In analysis the sample was weighted according to the numbers in each discipline subsample and the percentage of all underground workers represented by their discipline.

General Population Sample

Scores on psychological tests are most commonly interpreted by reference to "norms" which represent the test performance of a standard sample (Anastasi 1982). It then becomes quite simple to compare individual scores with the scores obtained by that standard sample. The I.T.R.U. established such a sample which they consider to be representative of the general working population under thirty years of age.

To arrive at this normative sample of the general population, groups from three geographic areas were chosen - Cambridgeshire, Harlow and Wales. Each main group had subgroups from both sexes, representing all the main industrial occupations and large enough in numbers to give reliably characteristic response patterns. Also included were groups of school children.
The response patterns were then analysed to find out whether or not there were occupational and regional differences.
The analysis of these response patterns showed marked differences between those of occupational groups but no great differences between those from each region. (The detailed results have been published in An Introduction to the J.D.Q. and Jobmatch. I.T.R.U. 1982) This supported the intended method of using the J.D.Q. which was to obtain definitive response patterns for different job groups to guide individuals towards jobs for which they were well disposed.

To facilitate the establishment of a set of job response patterns or profiles, it was decided to have a "general population" response pattern to represent that of the overall general population. This could then be used as a standard comparison against the responses of different job groups in establishing the job profiles.

As no regional differences between the three main samples had been found and as it was considered to represent British industry in microcosm, the sample taken among young Cambridge workers became the General Population Sample for use in further studies. Because some differences had been identified between male and female responses the sample was divided into male and female with separate profiles for each group. The numbers involved and some of the occupations are given in Appendix IV.

The statistical method of identifying a job profile was to be a chi-squared test used on each question to compare the observed frequency of responses among the job groups with the expected frequency as predicted from the general population sample pattern. It was necessary then to obtain as reliable an indication as possible of the responses pattern of the general population sample. To this end, the mean scores of all the occupational groups within the sample were determined and the final "General Population Response Pattern" obtained by taking a weighted average of the occupational means - weighted according to the proportion of the total sample represented by each group.

It was assumed that the inherent inaccuracies of basing the general population sample on the Cambridge regional sample were insignificant compared with the large differences between the jobs themselves (I.T.R.U. 1979). The general population profile merely provided a convenient standard reference with which to compare all other job profiles.

Establishing the Mining Profiles

To establish the mining profiles, the choices of the whole mining sample were first compared with those of the general population sample. It was found that in answer to twenty four of the questions, the miners chose particular answers significantly more frequently than the general population. This does not necessarily mean that a majority of the mineworkers chose each of those answers - simply that more mineworkers chose them than did the general population. The chi-squared test was used throughout to measure the results and only items which had a significance of .001 or better were included in the profile. These items are given in Appendix V.

Those twenty four items were then extracted and the responses from all the job groups held by the I.T.R.U. were compared with them. The results are given in Appendix VI and show that 79.3% of the mineworkers chose 14 or more of those items out of 24 - a much higher percentage of matching items than from other occupations. These twenty four items were taken to represent the "Underground Mineworker Profile".

Having established the general underground profile the next stage was to try and find any distinct differences between disciplines.

For officials the subsample was compared this time, not with the general population sample but with the weighted total mining sample. Allowing only items with a significance of .001 or better, a separate profile of 13 items was established. The comparative scores of the different mining subsamples on this profile are given in Appendix VII and clearly distinguish between the young officials and other groups.

The two craft subsamples of electricians and mechanics scored the lowest on the underground mineworker profile and so a profile for craftsmen - already developed by the I.T.R.U. for inclusion in Jobmatch - was introduced.
On this profile electricians from the Electricity Supply Industry have a mean score of 16.9 and the N.C.B. electricians a mean score of 16.1. The N.C.B. mechanics were also tested on this profile and had a mean score of 17.1. These results, included in Appendix VI, justified using the Jobmatch profile for the N.C.B. selection of craftsmen. However there were not enough differences between the two disciplines to merit separate profiles.

The selection procedure recommended after establishing the profiles was that applicants' responses should first be tested against the Underground Mineworker profile and successful applicants should then be tested against the other two profiles.

Administering the Test

Once the mining profiles had been established, a further meeting with the Area Heads of Training was held with the purpose of gaining some commitment from them towards completing the project. Four of them volunteered to give their full cooperation and, as this was the essential element for success, the project became centred on these Areas. Unfortunately, one of the four was such a distance from the others that it would have created a problem to visit it as necessary during the follow up period so, reluctantly, it was not included.
The three Areas used for the J.D.Q. were grouped quite near to each other in the central coalfields.

Arrangements were made, through the Area Heads, with Training Centre Managers for the questionnaire to be completed by all the 1982 intake of juveniles from the three N.C.B. administrative Areas. It was possible to arrange for this to happen on the first day of employment for all the participants, at the Area Training Centres, in classroom conditions and for the same person to conduct all the testing - giving the same introduction and explanation each time.
In this way 447 juveniles completed the questionnaire and their responses were marked against the profiles.

Follow up

To ensure that the job progress of the participants was properly monitored, visits were made to all the collieries where they would be employed to explain the project and gain the cooperation of as many Training Officers as possible. Even though I was working under the auspices of the Area Heads of Training, the acceptance of the project by Colliery Training Officers was by no means guaranteed. It has already been explained that some autonomy exists at each level in the Board's organisation and a Colliery Training Officer is not directly responsible to Area level staff, only functionally responsible.

It was quite necessary then to go to each colliery where the respondents were employed to pay a courtesy visit to the Colliery Manager to tell him of what we were about and then to meet the Colliery Training Officer. With him the project, the need for a follow up and the criteria for measuring progress were all explained and discussed. The progress report pro formas were introduced and arrangements were made for these to be completed and forwarded to me each quarter.
At some of the larger collieries the task was delegated by the Training Officers to one of their assistants. As these were the people who also acted as Training Supervisors this was quite acceptable and they too were also made familiar with all aspects of the project.

In this way forty eight collieries were visited - it must be admitted with varying degrees of success. Some Training Officers did not wish to participate, the extra office work entailed being unacceptable to them; others gave lip service to it at the time but did not participate in practice and it then became a matter of assessing the number of respondents involved at a colliery against the dubious effect of persuasion through more visits.

Interviews

As well as monitoring job progress through the chosen criteria, it was also suggested by one of the Training Officers that I might interview the respondents each quarter during the follow up period to give them an opportunity to assess their own progress. This would mean special coalfield visits for me but the suggestion was accepted. Because of the careful arrangements necessary to ensure that the trainees would all be available on the same day, shift patterns and educational timetables needing to be considered, the interviewing was confined to this one colliery.

Other Considerations

Our present selection process consists of written tests and interviews, at which school reports are often referred to. An attempt was made to obtain the written test results and copies of the school reports of respondents with the intention of using them as another set of criterion measures to compare with both job progress and the I.T.R.U. test results. However, it seems that once the selections have been made, both the N.C.B. test results and all else to do with that recruitment drive are consigned to the Area archives - en bloc - thus making it very difficult and time consuming to extract the particular information that would be required. Further enquiries in pursuit of this at colliery level revealed some copies of school reports held in the respondents' personal records and an extract of these is included as Appendix IX.

On examination this did not appear to be a useful line of investigation to follow because of the uncertain level of subjectivity involved in the reports. Also, because the respondents had attended several different schools, the format of the reports was quited varied and indeed some of the respondents were never given school reports - at least, they said not.

CHAPTER EIGHT

CHAPTER EIGHT

TRAINABILITY TEST

Introduction

A Trainability Test is a practical aptitude test, designed to be specific to the job for which it is required to select. This method of selection has already been used successfully in other practical industries.
In principle it is intended to test an applicants' ability to acquire the skills necessary to perform a job, and to do this in a reasonably short time.

The test is centred on some simple task, typical of the work a trainee would be expected to do. The test piece should be designed to include as many as possible of the physical and mental attributes needed to train successfully for the job in question.

The applicant is given a period of instruction on how to perform the task, then he is allowed to ask questions before attempting to do the task following the given instructions.

Procedures

The Trainability Test is job specific - which means here that the test piece has to be specially designed to match the job for which it is to select.

The procedures to be followed in designing a T.T. are:-

1. Analyse the job with reference to the key operations and essential skills which are required for its successful performance.

2. Select a task which incorporates these skills and operations.

3. Write a checklist of errors which are liable to be made during the performance of the task and faults which may be found in the end product of the test.

4. Decide on a range of ratings on overall test performance and provide a guide for instructors on the use of ratings.

5. Design and write a script for the instructor.

6. Stage the test.

The I.T.R.U. recommend that the best team for designing a T.T. should include a member of management and an instructor who has had considerable training experience. For the N.C.B. it seemed desirable to have a management representative from both Headquarters and Area levels - the latter having a more established authority at coalfield level.

It was realised that it would be very costly in terms of time and the provision of equipment to set up a test, and that the design team would have to be released from their normal duties. For these reasons the pilot study had to be confined to one coalfield - the North East. This was the first of many compromises that were made in this study.

So a design team of three was selected - myself representing H.Q., an administrative member of the North East Training Branch who was formerly in colliery management and an Advanced Mining Instructor from a North East Training Centre.

Job Analysis

In the discussions to find a task to represent "underground mining", in which a trainee might be involved, another compromise was made. The earlier description of our current selection procedures serves to indicate that there are many different jobs involved in the production of coal. The problem was to decide which one could be said to truly encompass all the essential mining skills. It was decided to eliminate the two most specialised disciplines of mechanical and electrical engineering and confine the choice to the mining discipline.

Listed under the mining discipline are over twenty different underground jobs - all quite distinct activities and each requiring its own specific training - any one of which a trainee could be involved in. The argument was put forward that the ultimate aim of selection would be to produce coalface workers - a successful trainee will progress through all the other jobs towards that goal - and a coalface worker must have all the general skills required in mining. The compromise was that it takes some time and experience before a trainee undertakes coalface training. It would not be part of his initial training. Even on the coalface though there are several distinct occupations and it needed further discussions to decide that the job on which to base the test should be concerned with the control of roof supports - in mining vernacular " a chock man".

The principles of Trainability Testing stipulate that actual machinery should be used in the real job environment. For the N.C.B. the actual machinery could be provided but it was not possible to use a real coalface - for obvious reasons. The plan for this pilot study had to be to use a mock coalface such as the ones which are used for actual coalface training at Training Centres.

Selecting a Task

The team dispersed to hold discussions with all the kinds of people who normally come into contact with coalface workers - that is instructors, supervisors and other coalface workers - to try and isolate the key elements which distinguish a skilful roof support man. In this at least it was possible to include views from several Areas of the National Coal Board.

The consensus of opinion was that the activities necessary to deal with uneven roof conditions called for most general mining skills as well as the ones associated with the particular task. Most important of all, they demanded a high awareness of safety, the ubiquitous element in all mining activity. Thus the task for the test became that of moving a pair of mechanised roof supports forward and placing wooden baulks, along with assorted small pieces of timber, above the supports to fill the gap between the top of the support and the roof.

To describe here the mining principles involved would be a somewhat lengthy process - let it suffice to say that the potential danger in this task is eliminated by going through a proper sequence of actions, specific to the task, as is the case in all mining activities.

Check list

The task is designed to test the trainee's ability to grasp the important elements of the job and the check list is designed for recording whether or not he shows that he has done so. It lists the possible procedural errors to be checked as the test proceeds and the possible faults in the end product of the test.

In addition to this listing of faults, the objective skill of the instructor is used to give an overall assessment of the test performance.

Script

The script is of the instructions to be given in the test. It is for the instructor to follow each time that he gives the test, to ensure that the instructions are always given in a standard way. The instructor should memorise it.

Writing the script helped to sharpen the test design but nevertheless the whole test, including the instructor's demonstration, question time and applicant's performance was quite lengthy requiring on average some thirty five minutes to test each trainee.

Administration of the Test

Again it was important to give this pilot test to trainees as near as possible to their first day of employment but several factors dictated on this point. Firstly, the complexity of the test "set" meant that only one test could be staged. Secondly, the authenticity of the set, as part of a confined coalface area, meant that only one trainee could receive instruction at any one time. On this point also it seemed important not to have any delay between instruction and test performance. Thirdly, 37 trainees - all of one intake of mining trainees at one Training Centre - were tested and each test took on average thirty five minutes. However, all the tests were given in the first week of employment and, hopefully, before any other instructions had been received which might have affected test performance.

Follow up

The same criteria were set to measure progress at collieries as were used to compare with performance on the J.D.Q. - i.e. absence, the number of jobs undertaken in the time period and assessment by the Colliery Training Officer. One additional criterion was introduced here though - the mining trainees take a test, set by the Training Centre, at the end of their introductory training. The mark obtained on this test was included to compare with test performance.

As in the J.D.Q. study, a long follow up period was planned, this time because the trainees would not be involved in coalface work, on which the test was based, for quite a long time. It was accepted though that any general mining work in which the trainees were involved in the meantime would provide an acceptable comparison with the test performance.

The trainees were allocated to three Northumberland collieries and following up on their job progress was made the responsibility of the North East Area Training Branch.

CHAPTER NINE

CHAPTER NINE

RESULTS

Visits were made to the collieries concerned throughout the follow up period, to brief new staff and to encourage those who were participating. However, in setting up both studies it was always accepted that it would be difficult to gain the full cooperation of all those necessary to monitor job progress effectively. In practice on the J.D.Q. study, this and other organisational reasons meant that reports were obtained on 193 trainees - less than half of those who were tested - and only 174 of those were properly monitored over the whole period. The follow up on the Trainability Test also foundered eventually amongst the organisational problems of staff changes and colliery closures.

The long industrial dispute in the N.C.B. brought all the field work to an abrupt halt, preventing visits to check colliery records to add to the study but enough results were gathered during the follow up period to justify analysis.

As part of my research studies, a course of instruction on computer techniques was undertaken. This included how to use the Statistical Package for Social Sciences and the general principles of computerised spread sheets both of which were used in the analysis and presentation of the results.

Analysis - J.D.Q.

The starting point for the analysis of the J.D.Q. results was to compare the test choices of juvenile trainees against the job profiles of the disciplines for which they had been selected - thus giving a basis for a direct comparison between job profile scores and job progress.

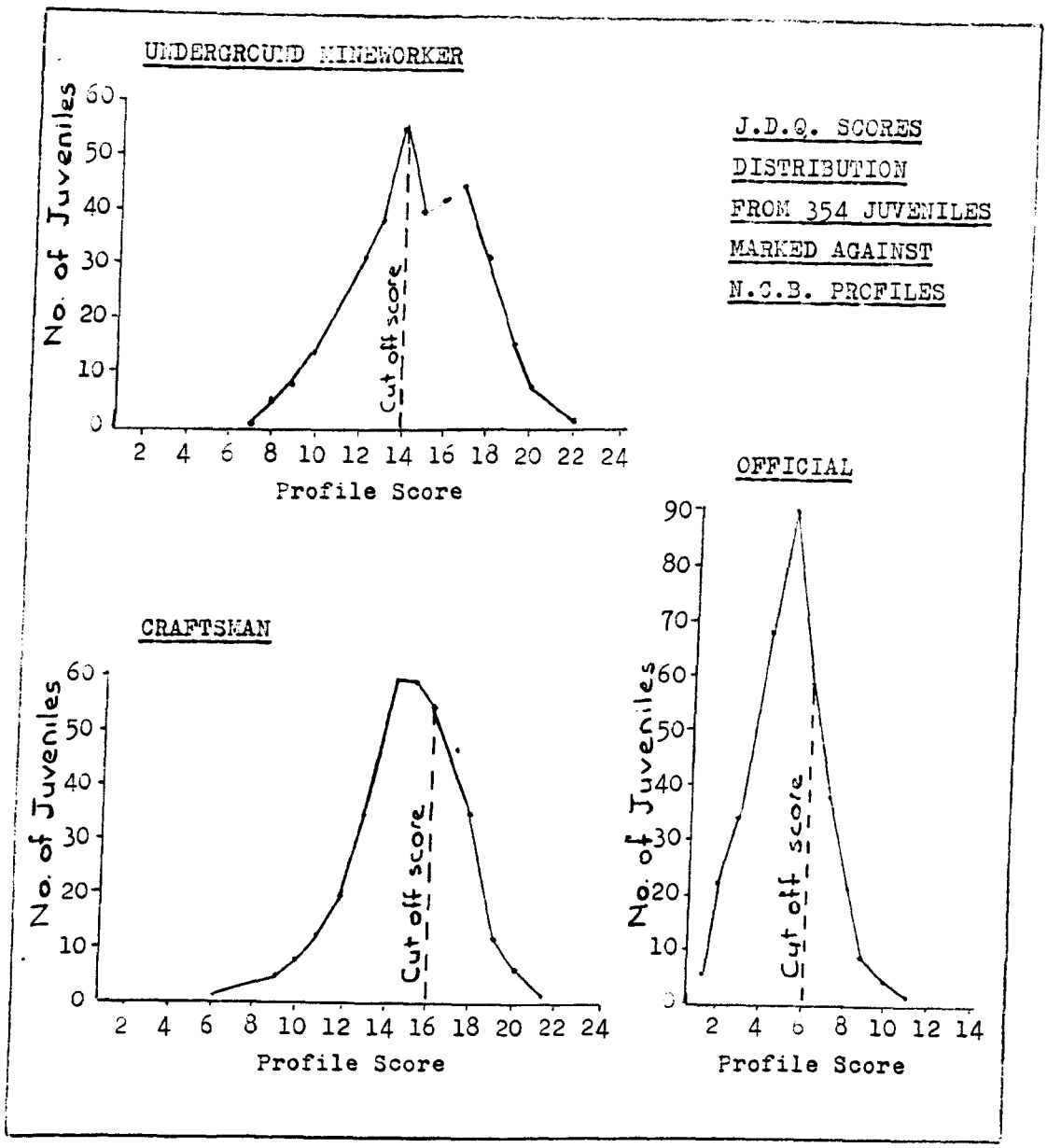
The "underground mineworker" profile was contributed to by all disciplines and, on the assumption that it represented the consensus preferences for all miners, anyone selected to work underground should then match the pattern set by this profile. So it was decided that, if the profiles were to be included in our selection procedure, the method would be to screen all the applicants against this general mining profile and then to further select for the disciplines from those who are successful on this first mining profile. This was the procedure followed with the answer sheets of our juvenile sample.

The cut off scores recommended by the I.T.R.U. from the scores distributions of our first sample of successful workers which established the profiles were :-

Underground Mineworker Profile	14
Craftsman Profile	16
Officials Profile	6

Diagram 1 on the next page shows what a good fit these cut off scores were on the distribution curves of our juvenile sample scores.

DIAGRAM 1



The curves show near normal distribution, with a slight kink in the mineworker profile curve but where 14 coincides with the mode score. The cut off scores came just after the mode on the other two profiles, giving the more rigorous selection standard required for the smaller groups. In practice of course the cut off scores can be regulated according to the degree of selection required.

Following this method gave two overall groups - the trainees who would have been selected on the mineworker profile and those who would have been rejected.

The successful group were then tested on their own discipline profile i.e. mechanical and electrical apprentices on the craftsman profile and mining craft apprentices on the officials profile. This subdivided the group into those who would have been selected for their present discipline and those who would have been selected for mining but not their present discipline.

That gave three groups - those who had "passed" for their present discipline, those who had "failed" for their discipline but "passed" for mining and those who had "failed" for mining.

A study of the test scores among these groups showed that of those who were successful for mining and their own discipline, some were actually successful on all three profiles and it was decided to use these as a fourth group. On the assumption that the profiles do select well for mining, these trainees should represent the "ideal" group against which to compare the others.

The encouraging thing was that trainees from all the work disciplines came into this latter group. As our current selection methods tend to place trainees according to general intelligence levels, this seemed to confirm that the J.D.Q. test contained a different selection factor and that it might be valid for all job disciplines.

Wastage

The study was set up originally to try to find a selector which would help to reduce the wastage rate among juveniles. In applying this it was also hoped that the overall standard of trainees would be improved.

A first, simple analysis was concerned with those trainees who left during the eighteen month follow up period. Using the four groups described above, this gave the following table :-

Groups	Group no.at start	Months	3	6	9	12	15	18	Total
		Leavers							
Passed on all profiles	22		0	0	0	0	0	0	0
Passed for discipline	77		3	1	0	2	1	0	7
Failed for discipline	14		0	0	0	0	1	0	1
Failed for mining	58		0	0	2	4	0	0	6

TABLE SHOWING THE WASTAGE AMONG GROUPS

No statistical correlation could be found but basing a direct comparison between groups on the figures shown in the table on the previous page, over the eighteen months of the follow up period - for every 14 trainees in each group, in the order given overleaf, the relative wastage rates would be 0 : 1.27 : 1.00 : 1.50.

The "ideal" group showed the lowest wastage rate of zero but the "failed for discipline" group spoiled the progression towards the highest rate of those who "failed for mining".

In the quarterly reports the Training Officers gave some of the reasons for leaving :-

Failed for mining
- Absence Dismissal
- Voluntary Wastage
- Unruly behaviour. Poor attitude to authority. Needs careful supervision. Work rate could be better. Warned re attendance & behaviour. Absence Dismissal
- Very poor progress. To H.M.P.
- Does not mix with other lads. Is a Colliery Manager's son and will take time to adjust if he does not leave first. Left.
- Office work because of injury. Not very promising start. Does not seem interested in work. Left but would not be reemployed.

Failed for discipline - Left to join R.A.F.

Passed for discipline - Good worker. Asked if he would like to take more studies. Left to set up own business.

- Left voluntarily
- Left voluntarily
- Died in road accident
- Dismissed for misconduct
- Moved away with parents
- Warned re absence

Left voluntarily.

In the "failed for mining" group is a tendency towards negative reports and three out of six were dismissed. In the other two groups the reports are more positive and only one out of eight was dismissed - for misconduct i.e. breaking the rules rather than poor work.

Progress

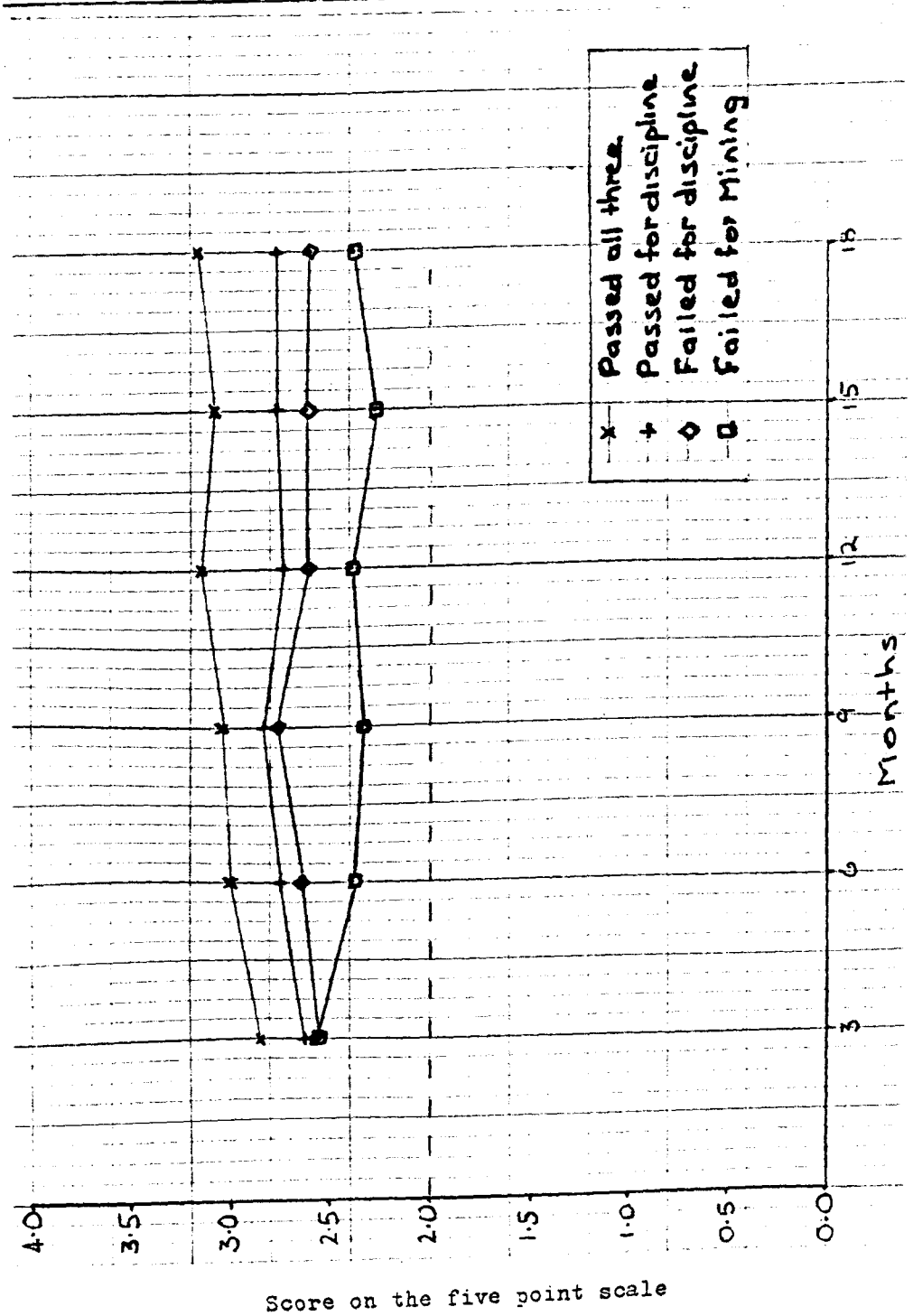
The second criterion to be analysed was the assessment of general progress by the Training Officers, using the five point scale labelled very good, good, average, below average and poor. Giving the scale a numeric value from 4 down to 0 the line graph in Diagram 2, on the next page, plots the average scores in each report period for all the four groups.

The expected hierarchy of averages is nicely maintained throughout the follow up period but it is noted that all the scores are above the average mark.
It should be remembered though that these were pre-selected juveniles so perhaps this is confirmation of the efficacy of the present selection system. On the other hand, it may reflect a reluctance on the part of the Training Officers to give a low assessment for their trainees - but there are some "below average" and "poor" scores and the T.O. is not responsible for the initial selection.
Another point may be that the probationary period does allow time to direct the trainees towards tasks for which they are suited, there is quite a variety open to them, and those that really cannot fit in leave.

DIAGRAM 2

GENERAL PROGRESS

GROUP AVERAGES FOR EACH QUARTER



Absence

The criterion of absence was recorded with the three constituents of voluntary, sick and accidental absences. In practice the accident absence, due to reportable work accidents, was very small - as it should be because trainees are closely supervised, often on a one to one ratio. Happily then this class did not lend itself to analysis but was included in total absences.

In reporting the sick absences the Training Officers specified the reasons for long absences (e.g. motor cycle accidents, measles, mumps etc.) and although these are spread through all the four analysis groups, just one long absence quite distorts a quarterly average.
The intention of using sick absence as an indicator of physical aptitude for the job was also found to be beyond the scope of the project. A proper analysis would require a much more detailed study of reasons for sick absence, medical reports, sick notes and even then, perhaps, a degree of surmise.

For these reasons just two kinds of absence were measured - Voluntary and total. Without making any adjustments but simply averaging the numbers as recorded for each group in each quarter, those absences are plotted in Diagrams 3 and 4 shown on the next two pages.

DIAGRAM 3

VOLUNTARY ABSENCE

GROUP AVERAGES FOR EACH QUARTER

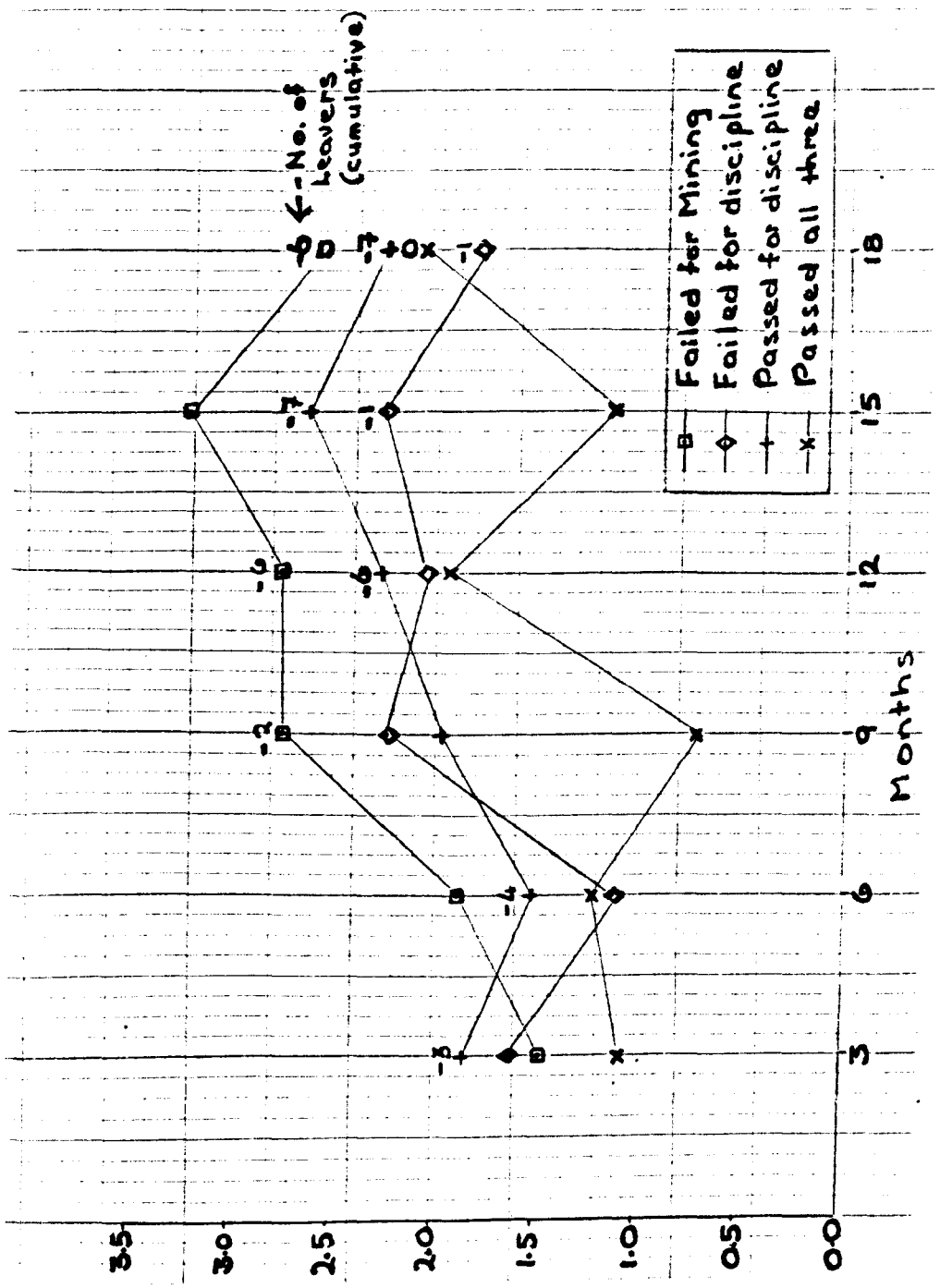
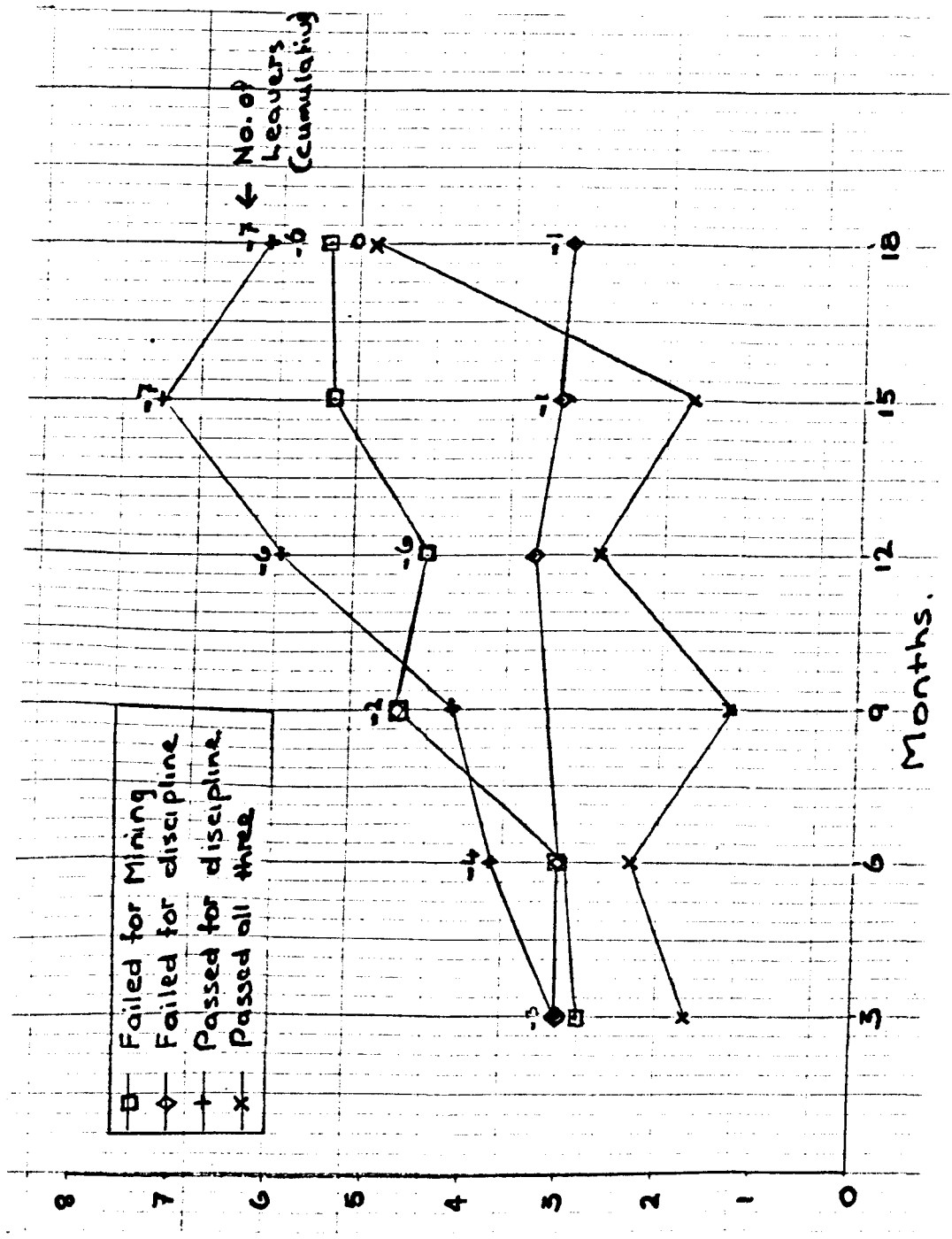


DIAGRAM 4

TOTAL ABSENCE

GROUP AVERAGES FOR EACH QUARTER



The only categoric observation that can be made about the attendance figures is that the "passed on all three" group has a better record than the "failed for mining" group in each quarter. After that observations must be qualified. The "ideal" group has the best overall attendance record but not the best in every quarter and, conversely, the "failed for mining" group has the worst overall voluntary absence record but not the worst total absence record. One could go on qualifying these figures but really it is not a clear cut picture. Perhaps this is understandable though. There are myriad factors which contribute to each of our criteria and on the progress scales the Training Officers took many of them into account when making their assessments. For absence the factors have not been weighed and smoothed for us - we do not know all the reasons, only a few of them and some may not have anything at all to do with the work situation.

There is one rather alarming point of observation if the profiles are valid, and that is the rate of absence among the "passed for discipline" group. It is the largest group and as such is liable to more chance sick absence but the voluntary absence is higher than would have been expected. However, it also has the largest clusters of trainees based at specific collieries and it seems evident from the figures that managerial tolerance of both voluntary and sickness absenteeism varies between collieries and Areas.

Statistical Significance

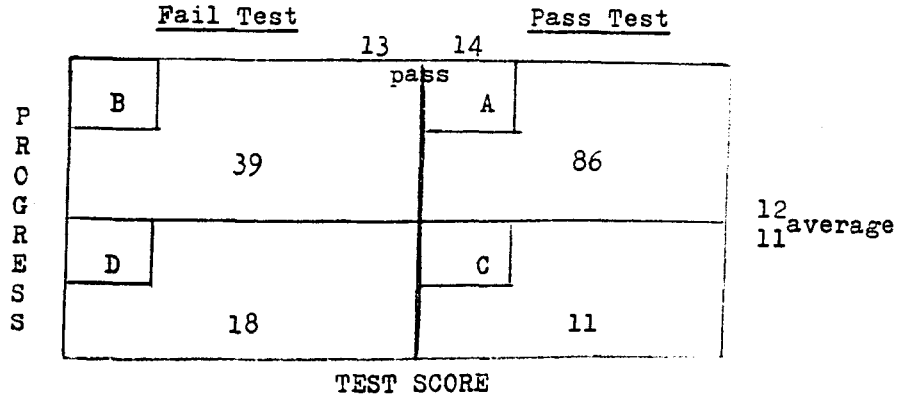
The application of Spearman's coefficient of rank correlation showed no statistical significance between test scores and either progress points or absence figures.
Spearman's coefficient was used because it provides the means of measuring the association between two sets of ranked data. It was also felt that the results from both test scores and follow up data represented ordinal rather than interval scales, for which Spearman's coefficient was appropriate.

Perhaps the differences in the ranges of the sets of data may help to explain the lack of statistical significance - at least between test results and progress scores. After all, the progress scale only covered five conditions and Training Officers were reluctant to place the trainees on the lowest point of the scale. This meant that mostly only four conditions were used to describe job progress and even the poorer trainees had their better moments.

From the literature and in discussion with the I.T.R.U. it would appear that it is quite usual in validity studies of psychological tests to fail to find any statistical significance between predictor and criterion measures, particularly when a relatively narrow criterion assessment scale is used. However, the average scores on job progress in particular showed such a neat fit in the group rankings that it is difficult to dismiss it as being invalid.

Scatter Diagram

A different way of analysing the progress scores against the profile scores was tried using a scatter diagram. The sum of the progress scores over the six quarters was plotted against the test scores on the mining profile and produced the pattern below. The accepted progress score was set at the average mark of 12 while the profile pass score was 14, as set by the I.T.R.U.



A few simple calculations provide some standard measures:-

1. The "success ratio" is quite good - of those who passed the test, the proportion of good trainees is $\frac{A}{A+C}$ = 88%
   Over the whole group the proportion is $\frac{A+B}{A+B+C+D}$ = 83%
2. Of those who are rejected by the test the proportion of bad trainees is $\frac{D}{C+D}$ = 54% , again acceptable
3. The poor trainees $\frac{C+D}{A+B+C+D}$ represent 18% of the total sample.
4. The proportion of the whole sample rejected by the test $\frac{B+D}{A+B+C+D}$ = 34%

This presents an overall acceptable level of discrimination by the J.D.Q. but it should be remembered that the decisions about the critical scores are factors which have a direct bearing on the success ratio (Drenth 1971).

Job Rotation

The quarterly reports also asked for a list of activities undertaken in the period and the length of time spent on each one. It was hoped that this would indicate the trainees' aptitude for learning mining skills. The three apprenticeship schemes describe specific patterns of job rotation and the allotted time for training on each task. If a trainee is not competent at the end of the training period he undergoes more training until he is considered to be so.

In the main these rotation patterns were followed but there were exceptions. Pursuing these exceptional cases on visits to collieries, and in other conversations with Training Officers, it transpired that sometimes when there were deployment difficulties trainees were kept rather longer on tasks than was strictly necessary for their training because they were good, dependable workers who could be trusted to do the job properly. Although this was mentioned in only a few instances, nevertheless the possibility that this factor might have intruded in other cases raised doubts about the value of this part of the report. Consequently it has not been analysed in any way.

Interviews

Quarterly interviews were held at the one colliery where the Training Officer had suggested this. The interviews were arranged to take place at the end of the day shift - the most convenient time in a colliery day. This required certain organisational arrangements: that all the trainees were working on the day shift because they normally alternate between day and afternoon shifts; that none of the trainees were away at school on the day; and that their supervisors were informed to allow them to come up the pit early to attend.

The interviews were partially structured in that some basic questions were always asked e.g. reasons for any absences, what jobs they were doing and for how long, did they like doing them, did they get on with the people they were working with, did they like mining generally. An attempt was made to keep these occasions as informal as possible. The Training Officer was very interested and, because his office was the only available place to hold the interviews, it was very difficult to exclude him. His presence tended to inhibit any real dialogue with the trainees towards whom he had a very paternalistic attitude. On the other hand, he was very useful in bringing out all the small incidents that had happened during the report period.

It was an interesting exercise from the behavioural aspect but there was nothing that could be directly equated with the profile scores, other than the usual progress and absence records.

Two of the trainees were Mining Craft Apprentices - both scored 14 on the general mining profile but only one would have been selected at the next stage on the discipline profile. They had both settled down well by the third quarter, both had very good Technical College results. The only apparent difference was that the one who passed for his discipline had no voluntary absence at all while the one who would not have been selected had seven voluntary absences onver the whole follow up period. His reasons for the absences were always plausible and had nothing to do with work.

The other five were Mining Trainees who would all have been selected on the profiles. Their standards of progress did not always correlate with their profile scores nor did their voluntary absence patterns equate with their statements of how much they liked the job. However, the trainees knew well beforehand of the interviews and expected them each quarter. It might perhaps have been more useful if they had not been prepared and if the interviews could have been held in private with the trainees persuaded of my total discretion.

Selection Test Scores

The present N.C.B. selection procedures include written tests, already mentioned. Among the personal records of some of the trainees that were involved in the interviews were the results of those written tests. The tests and the scores are included as Appendix XI. A Spearman rank correlation showed no significance at all between scores on the written test and the underground mining profile.

Trainability Test Analysis

The follow up of the trainees who undertook the Trainability Test was, unfortunately, not of very long duration. It was always accepted that it would be some time before the trainees undertook face training - the job for which the test was designed to select. This time period became even more extended when one of the collieries where the trainees were employed was closed. Although the trainees were all transferred to other collieries, this usually meant that they were again at the bottom of the waiting list for face training. This became very discouraging to all concerned and the tasks undertaken by the trainees seemed to become less and less relevant to the test.

Soon after the administration of the test to the trainees, there were also staff changes at Colliery, Area and Headquarters levels. This disrupted the administration of the follow up. However it was always known that a check could be made on absence at some later date.

For the reasons already given plus the current industrial climate preventing colliery visits, the results for this part of the study are rather sparse. There is a set of Training Centre End Test results to compare with the test scores and one set of job progress scores covering the first six months of employment.

There does not appear to be much correlation of any kind on any of the results and indeed a Spearman rank correlation shows no significance between any of the sets of results - trying all the possible comparisons. The only point of agreement on all three sets of scores would seem to be at the extremes of each scale and most particularly at the bottom end.
The results are given as Appendix VIII.

This part of the project illustrates the difficulties of sustaining a longitudinal validation study, particularly in a large organisation where the size encourages an upwardly-mobile staff.

CHAPTER TEN

CHAPTER TEN

FINDINGS & DISCUSSION

The absence of any empirical correlation in the follow up data should not be allowed to detract from the practical evidence of a good match between test and progress scores. Drenth (1971) states that, despite observances of the classical rules for test construction and validation, the results of empirical validation research in psychological testing are still generally poor. This has in some cases led to psychologists returning to selection without research "claiming near miracles of clinical insight" (Dunnette 1963).

By comparison the N.C.B. project offers real encouragement to carry on further. The first part of the J.D.Q. project was successful in establishing that the profiles could significantly differentiate mineworkers from other population groups, and subgroups from each other within mining; the task of collecting the follow up data from many different locations extended over a long time period and was completed with a loss of continuity from only a few sources; and there is enough practical evidence of some relationship between progress and test scores to encourage further observation of the participants.

However, the recent long running dispute in the N.C.B. brought all field work to an abrupt halt and it is still too soon to take up colliery observations again. The work patterns and work relationships are not yet as they were before the strike. Unable to add further observations for the time being then it must suffice here to discuss the administration of the project so far and compare it with two other studies to which the I.T.R.U. directed me.

One study was completed by them in conjunction with the Electricity Council's Industrial Relations Department and the other was carried out by AnCO - the Irish equivalent of the Manpower Services Commission. Both studies were concerned with comparing the predictive quality of Jobmatch amongst young recruits with that of standard aptitude tests - the Vernon arithmetic test, the GUPTA mechanical comprehension test, the NIIP apprentice test battery in one case and the General Aptitude Test Battery in the other.

The methodology of these studies gave an indication of how ambitious our project had been in attempting to monitor the participants continuously for eighteen months. The E.C. study gave an initial J.D.Q. test at the time of selection for apprentice training and then simply retested the remaining participants three years later, obtaining one lot of instructors' assessments on progress given at the time of the second test. In the AnCO study tests on appropriate J.D.Q. profiles were given at the beginning of skills training courses lasting only five weeks and instructors were asked to give one assessment of performance for the whole training period using a set of fifteen dimensions.

In the N.C.B. study it was sometimes difficult to maintain the interest of assessors over the eighteen months and the work on the Trainability Test for coalface workers certainly came to grief because of the attempted continuous assessment. Administrators moved on to other posts, collieries closed and participants were moved to other collieries not involved at the beginning of the project and could not be persuaded to undertake the chore of regular reporting.

Because it is so long before a trainee can become experienced enough to undergo face training, the original study was concerned with intermediate criteria so perhaps all is not lost. The N.C.B. trainability test participants could be assessed later - as in the E.C. study - once they have reached the ultimate criterion of performance at the coalface. A single assessment by the instructor of performance during coal face training could be an acceptable measure to compare with performance on the test piece designed to select those most amenable to coalface work.

The E.C. study, like ours, looked at the J.D.Q. as a predictor of labour turnover. They too found no significant difference between leavers and stayers but that a slightly higher proportion of leavers than stayers had a low profile score. In both that study and ours it would seem that the J.D.Q. is not a good predictor of labour turnover but there is an indication that really low scorers do tend to leave or are dismissed.

The conclusions of the two outside studies was that on its own the J.D.Q. was not as good a predictor of performance in training as the aptitude tests but one study did add the proviso that the ultimate aim of selection was to find good workers - not trainees.

Because of some positive correlations, both were reluctant to dismiss it altogether and recommended its use to give guidance towards specific skills once initial selection had taken place or as a secondary selection test if initial scores were low. The E.C. study was completed in 1931 and it has been observed that the J.D.Q. is still being used in some parts of their industry for selecting apprentices.

The results of the N.C.B. study show likewise that there is no significant correlation between test scores and performance but the measures of progress and absence criteria show some positive relationships.

Here the question should be asked about whether the chosen criteria formed an adequate basis for the study. The goal of "good performance" is really an ideological term formulated from values, ideas and norms. Which criterion behaviour best represents that goal is not a matter for empirical investigation but one of judged relevance and acceptability (Drenth 1971). Indeed the choice of criteria is ultimately the responsibility of the sponsor for these reasons, and so it was seen to be in this study. Much discussion took place at all levels within the industry concerning which were the best measures of performance and all were in complete agreement that assessment by the training supervisor based on standards of competence already familiar to him, augmented by the attendance record, would provide the traditional and accepted best measure of a good worker.

In the original choice of criteria it was intended that absence should be broken down to represent the three dimensions of contentment, physical co-ordination and physical aptitude but in practice this did not prove to be feasible. Without the supporting evidence of detailed doctors' reports the distinctions proved to be mere surmise. Thus the validation study was reduced to quite a simple model of the test and two criteria. It may be that this was inadequate, Dunnette (1963) advises - "multidimensionality !"

There is also an inherent assumption that all training supervisors interpret the standards of competence in the same way, which in turn leads to a further question about the geographic spread of the study.

Among the possible reasons for the low correlation in research studies is one that the groups used for validation are much too heterogenous. Ghiselli (1964) showed that the group to be studied can often be classified into subgroups for which either no validation or a much higher validation exists than is indicated by the average correlations for the whole group.

When standard aptitude tests were correlated with performance on presumably similar jobs in industrial validation studies, the validity coefficients were found to vary widely. With our widespread study there had to be a lack of uniformity in working conditions - geological variations being one very apparent factor.

A colliery is a place where coal is mined - but every one is different from the others and even within each colliery conditions underground can show immense variations. In this study then it would have been impractical to select strictly homogenous groups because the sample sizes would have been too small.
It was observed from the results though that the amount of voluntary absence permitted before a disciplinary interview was given varied most between Areas, presumably following Area policy. Thus it may be that an Area grouping could be rewarding but the collection of more data from colliery records would help here by increasing some of the sample sizes.

The requirements of specific situations which precisely matched those under which the tests had been validated were regarded as serious limitations to the use of psychological tests until the mid-70s. Work was done then by Schmidt, Hunter and their associates demonstrating that much of the variance among obtained validity coefficients may be a statistical artefact caused by small sample sizes, a restriction of range in employee sample and criterion unreliability.
Both sample size and the range of employees was dictated to us by circumstances but the original sample size seemed to be adequate, although it was always realised that our participants were pre-selected and we could not include those who had been rejected. The number in the final sample is much less than those in the original testing so, again, the study could be enhanced by the collection of more follow up data.

Work is a complex situation contributed to by many factors including the quality of management, the degree of support given by supervisors, environment, social groupings, the demands of shift patterns and all in addition to the influences from the domestic situation. It is known that in recording the progress assessments, training supervisors made allowances for special circumstances and in so doing they presumably increased the reliability of that criterion measure. It has already been noted that the absence figures are merely raw scores and it may well be that a more detailed study of the reasons for absence would allow adjustments to be made which would improve the reliability of that criterion as a measure of the contentment of the employee.

The criterion of assessed progress was given as a rating on a five point scale. In that form it is open to the criticism of "central tendency" in that the assessor tends to avoid making a judgement and opts for the centre of the scale. They also tend to avoid the extreme points of the scale. All this was accepted when the scale was devised, indeed a five point scale was deliberately chosen because it would avoid resentment against providing an assessment where a decision was difficult to make.

Another pitfall in using subjective ratings is the "halo effect" whereby assessors rate those who do well on a test as high performers on the job and reversely for poor test scorers. This at least was avoided because the assessors were unaware of the test scores.

Another aspect of the halo effect may have obtained though. The workforce at any one colliery tends to be drawn from a specific geographic area and so several members of the same families can be employed there. It can be that certain characteristics are established by some members of the family which are universally applied to the rest - the sins of the father - or even the virtues, can be visited unjustifiably upon the others.
It is not possible of course to know how much of these two factors were present in the assessments for our study.

Much work has been done to improve ratings as a measure of performance. One suggestion is the use of dynamic criteria i.e. not performance level during a certain period but rather improvement in performance (Bass 1962: Ghiselli & Haire 1966: Manning & Dubois 1958). Unfortunately this method does not lend itself to a standard format and comparisons are difficult over different groups. However if in future studies smaller groups were used, this method of assessment should be considered.

In favour of the J.D.Q., it is certainly very simple to administer, indeed in the form of Jobmatch it has been presented as a self-help careers guidance package for school leavers; it is quick to score using the profiles as marking stencils; it would fit in well with the current procedures as part of the general selection or as a final stage after paper tests and interviews with the acceptable score set at whatever level provided the required number of recruits.

It could also add an element of self-selection if the applicants were made aware of their own scores, in the manner of Jobmatch, but perhaps that is expecting too much of young persons seeking employment in the present economic climate.

In general, the strength and direction of the individual's interests, attitudes, motives and values represent an important aspect of personality and these characteristics materially affect occupational adjustment, interpersonal relationships and other phases of daily life (Anastasi 1982). The J.D.Q. seeks to explore this aspect in a different way from any in our established recruitment procedures. It may overlap the interview to some extent in its purpose but nevertheless it could add a different dimension to our selection process.

For various organisational reasons the Trainability Test in this study was based on the job of coalface work, where each task can be quite complicated and always involve a high measure of safety awareness. When a trainability test is given, no time limit should be set for the applicant to complete his part but in this test the standard demonstration of the test piece by the instructor took a full fifteen minutes. A trainability test should also be difficult enough so that even good candidates make at least one error but out of 37 tested in our study, 27 made five or more errors and some of these made so many errors that the set became dangerous and the test had to be stopped.

Although the factor of testing an applicant's ability to remember the instructions is an inherent part of the test, nevertheless it could have been that the test piece was too long.

The test set was also quite elaborate - staged in a training gallery on a simulated coalface, with three large mechanical roof supports, two heavy eight foot long timber baulks, several small pieces of timber, a length of metal face conveyor and an electrical signalling system - all this to represent as nearly as possible an actual coalface. Thus on the grounds of the cost of staging the test and the time taken to test each trainee, it is unlikely that every Area would be able to undertake the use of this test. The choice of coalface work, which is at least three years of underground experience away for a young entrant trainee, has also dictated the need for a long validation period.
A simple task, but representative of general mining skill, which a trainee might undertake during his first year underground would have made this part of the study much easier to design, administer and bring to a conclusion. It would also have made the test far more acceptable for general use in the light of any positive correlations.

It was hoped that the trainability test would explore the aptitudes and skills of applicants for mining. Indeed in other applications it has been used successfully in the selection of forestry workers, knitwear machinists, bricklayers, electrical apprentices and fork lift truck drivers, to name a few examples.

The procedures used in designing a trainability test are well founded in the "job element" method for constructing tests; and the job element can contribute substantially to the evaluation and accreditation of experiential learning (Anastasi 1982). And so it is with the trainability test - the original use was to give guidance in retraining adults, people who had been made redundant from industries cutting back on their workforce or women returning to work after a gap of some years. A battery of different tests was used to measure existing skill levels and those which they were most readily able to learn.

The Trainability Test also has the advantage of high content validity which is absolutely essential to gain its acceptance within the industry. Selection without a special aptitude test has become so well established that the need is not recognised in every quarter of the N.C.B. Indeed it may well be, as is so often stated but not empirically demonstrated, that the underground environment is the real selector and given an employee who can accept it then there are enough different skills required underground to find a niche for most men. Unfortunately, the rules of safety, insurance and limited shaft capacity to take people underground mitigate against including this in present selection procedures but it may well be that in future studies an attempt should be made to test realistically this popular notion.

The main part of the validation study became concerned with only the J.D.Q. This was mainly because of staff changes amongst those with a responsibility for collecting the Trainability Test data.

Ribeaux and Poppleton (1978) define two main functions in the use of industrial psychological testing: interest inventories for careers guidance where the focus is on a person's perception of himself and emphasis is given in helping him to become more accurate in his perceptions of himself; and trainability testing to predict job performance. Further, that the main focus of concern in selection is job performance.

The J.D.Q. was designed for use in careers guidance, it is the Trainability Test which is directed towards predicting job performance. With the lack of statistical correlation in the data from either part of the study but some positive indication in both, it perhaps becomes a matter of industrial objectives as to which one should be pursued.

Prior to World War I psychologists had begun to recognise the need for tests of special aptitude and these "special aptitude tests" were developed particularly for use in the selection and classification of industrial and military personnel (Tyler 1963). The pressure for selecting among large numbers in World War I prompted the development of group testing and the self-report interest inventory.

Similar pressures in World War II produced the multiple aptitude batteries and the situational tests from which work sampling tests developed - the Trainability Test being of that genre. Reviews of recent research show evidence of an upsurge of interest in selection testing prompted by the current pressures of an oversupply of applicants and the need to select effectively and fairly.

A relevant concern stems from the demonstration of a relationship between productivity and the validity of selection instruments. In organisations.having many employees, the cumulative value of such gains or losses is so large as to deserve close attention (Anastasi 1982).
In 1976 Sneath described the cost of selection testing as one of the reasons why it was not generally accepted in industry. The work of Schmidt and Hunter at the beginning of the 1980s has shown that, in spite of the initial costs, selection testing can be highly cost effective. No doubt this will have encouraged occupational psychologists in this aspect of their work.

The arena for occupational psychology has also changed since Sneath (1976) identified a lack of personnel in industry with the expertise to administer tests. Wedderburn (1983) chose three of his colleagues in the British Psychological Society to illustrate the contribution of present day occupational psychologists employed by large companies, in this case Shell, STC and Chloride.

Observation of recent literature - the present series on selection tests in Personnel Management, the new publication Guidance & Assessment Review published by The British Psychological Society and descriptions of what is available through NFER-Nelson and other independent consultancies - indicate a renewed interest in industrial psychology. Discussions with members of the I.T.R.U., with people from the Engineering Training Board, Electricity Council and members of the British Psychological Society who are all currently involved in various studies, confirm that there are a lot of "in-house" industrial psychological studies taking place which are not published.

Of the published work, most is concerned with administrative and managerial selection perhaps because this is where the highest cost returns can be effected. It may also be that no general demand has yet been identified for the industrial level - most companies, like the N.C.B., have been shedding rather than recruiting labour. The apprentice situation too has not changed since the 1970s when work with the Industrial Training Boards showed that because apprenticeships were awarded on the results of City & Guilds examinations, the most valid form of selection for apprentices is by the use of paper and pencil tests, with the addition of "O" level English Language.

The work that is going on at present at the industrial level would seem to be concerned with improving rather than revolutionising present methods; finding a more appropriate form of test or some extra refinement, as shown by the E.S. and AnCO studies.

One project - the Southampton Common Selection project - is concerned with reducing the costs of selection to individual companies by organising a central testing service whereby applicants undergo just one series of selection tests, the results of which are accepted by all the subscribing firms.

A point in common between all the studies just mentioned though, that is absent from the present N.C.B. procedures, is the validated and established use of special aptitude tests in the selection of the young industrial workers.

In the absence of any real correlations from this N.C.B. study, we must accept that our present paper and pencil tests are still the most valid for selecting our apprentices. However, for the N.C.B. the selection and recruitment of juveniles is concerned with three groups - craft apprentices, mining apprentices and mining trainees. Perhaps then it is the latter group, mining trainees who do not undertake academic examinations, that we should focus on. The Trainability Test was introduced to representatives of this group and, in spite of any shortcomings in the test and the sparseness of follow up data, the results at the bottom of the test performance scale did show some relation to both the End Test at the Training Centre and poor performance in on-the-job training. The I.T.R.U. Trainability Test overcomes the criticism which has been raised before in the N.C.B. of tests not being appropriate to mining, because it is designed for each particular job and should have undisputed face validity, while the work already done would form an admirable basis for further investigation.

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Early job progress reports on the participants in this study showed some apparent correlation with the Trainability Test performance and any improvement in the N.C.B. selection process is most likely to come from the inclusion of this type of test. This part of the study would seem then to hold the most promise for the future selection of juveniles for the mining industry.

However, the Trainability Test in this project appears to have been too complicated in its design, too long in its assessment, too ambitious in its geographic spread and too limited in its criteria.

The elaborate design imposed undesirable limitations and any future project should be based on a much simpler task and one which a trainee would undertake during his first year of employment. This should only require a simple set, easily staged, so that it could be used in any mining location and not just at certain Training Centres.
This would also mean that the assessment period could be much shorter and with a reduced time scale hopefully the same staff would be involved throughout, thus reducing the many difficulties experienced in the collection of data in this extended, longitudinal study.

Any new study should also be directed to just one administrative Area so that personnel policies, which are largely dictated by Area staff, would be applied in a uniform way.

One further consideration should be concerned with the criteria used for measuring progress. In this study the five point progress scale was extracted from the statutory report which the Training Officer is obliged to provide every three months on all employees under eighteen years of age. Nevertheless, doubt has arisen about the uniformity of interpretation by the assessors of the scale description. The other criterion of absence reports was also extracted from established colliery procedure.

In a shorter study there should not be the same need to avoid alienating the colliery assessors because it would involve less paper work from these essentially practical men. A study confined to one Area would make it possible for all concerned to maintain much closer contact with each other, there could be more general involvement in the discussion and planning stages and any administrative difficulties could be readily identified and help given.

This study has also shown the limitations of some of the original criteria but with a less ambitious and shorter study it would be feasible to introduce a far more comprehensive set of criteria based on more objective aspects of job performance, selected to meet the requirements of the validation study rather than limiting the assessment to existing procedures.

In conclusion, this National Coal Board validation study is part of the new wave of interest in selection testing for industrial personnel.

The results of the Job Disposition Questionnaire study correspond with those of other industrial studies confirming no statistical correlation between test and job performance but an observable positive trend indicating that it may have some potential use in the placement of pre-selected juveniles.

There is also enough general evidence to encourage the continuation of the work on Trainability Testing. However, any follow-up study should be concerned with a less complicated overall design, involving a smaller number of participants but incorporating a wider range of criteria. This could be of value in improving the selection of young industrial workers in particular for the National Coal Board, to meet the challenge of refining our industry to meet present market demands.

A fundamental objection to the use of interest inventories in the selection process is that the items in such inventories tend to be transparent. The applicant can often determine by reading the item which response will portray his interests most favourably for the job in question. He is thus able to make the 'best' or 'most appropriate' response even though it may not be indicative of his true interests (Siegel 1969). Thus the validity of replies to interest inventories in the selection situation is open to question.

For counselling purposes the respondents can be induced to respond as honestly and accurately as possible in their own best interests, on the grounds that it will help to place them in the most suitable job in which they will be most successful. Interest inventories are then widely regarded as being most useful for placing personnel in their best discipline rather than for their initial selection. The lack of statistical support in this study would seem to conform with this general opinion and any further work with the J.D.Q. in the National Coal Board should be directed towards investigating its use for placing the juveniles into the different mining disciplines once selection has taken place.

The Trainability Test, on the other hand, can be seen as part of the long-established tradition of special aptitude tests, many variants of which are in current use for selecting personnel, for example the N.I.I.P. Apprentice Test Battery used by the E.S.C. and the GATB used in the AnCO study.

APPENDICES

Description of Underground Mineworker

This is a compilation of the item wording of the J.D.Q. Underground Mineworker profile.

"Mineworkers would prefer to work away from an office or factory and they do not mind working underground. They prefer not to have to keep things clean and do not mind getting their hands dirty. They can put up with excessive cold for short periods and, although they prefer to stand most of the time, they do not mind uncomfortable positions some of the time. Fumes and smells they could get used to.

They like working on medium sized jobs and to make useful articles using power driven tools which are hand controlled. They like doing several parts of a job, want some variety in their work and enjoy switching jobs with others. If reports have to be written they prefer to do them themselves, and they like to be responsible for checking their own work.

Mineworkers like to have contact mainly with their own workmates rather than with members of the general public."

JOB DISPOSITION QUESTIONNAIRE

In this booklet you will find questions about different aspects of work.
First answer the two questions below by putting a tick ( ) alongside your selected answer.

A. Would you prefer a job
a) Outdoor
b) Indoor

B. Would you prefer
a) Day work
b) Night work
c) Some of both

Now carry on, recording your answers alongside the number of each question.

Try not to spend too long on each question. The questions are sometimes too short to give you all the information you would like to have; give the best answer you can.

Answer as honestly as possible.

PLEASE ANSWER EVERY QUESTION.

Industrial Training Research Unit Ltd
Lloyds Bank Chambers
Hobson Street
Cambridge CB1 1NL
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Code No. .....

Please do not write on these sheets

No.	Question	Answers
1.	What would you most like to work with?	a. Hand tools (not power driven) b. Power driven tools or machines which you can control c. Power driven machines automatically controlled
2.	Would you like to make things:	a. That have to be very exact? b. Where exact measures are less important?
3.	What size jobs would you like to work on?	a. Small (under 1 ft) b. Medium (1 - 5 ft) c. Large (over 5 ft)
4.	Some jobs involve making calculations. Would you prefer?	a. To do these calculations yourself? b. For others to do this work?
5.	Some jobs involve making technical drawings. Would you prefer:	a. To do this work regularly? b. For others to do this work?
6.	Sometimes reports have to be written. Would you prefer:	a. To write reports yourself? b. For others to write the reports?
7.	Would you mind having a job where a good memory is important?	a. Yes b. No
8.	Would you prefer a job that involved:	a. Making or constructing new things a good deal of the time? b. Making or constructing new things some of the time? c. Hardly ever making or constructing new things?
9.	Would you prefer a job that involved:	a. A good deal of maintenance and repair work? b. Some maintenance and repair work? c. Hardly any maintenance and repair work?
10.	In some places there is a wide range of jobs to be tackled. Would you like:	a. To become expert on one or two of them? b. To switch jobs with others for the sake of experience and variety?

No.	Question	Answer
11.	Many jobs are done in various parts. Would you prefer?	a. To do them all yourself? b. To do several parts? c. To do only one part?
12.	For your work would you like to have:	a. Complete but straightforward instructions? b. Some instructions and some opportunity to use your own ideas? c. Minimum instructions so that you have to use your own ideas?
13.	Would you prefer:	a. A great deal of variety in your work? b. Some variety in your work? c. A regular routine?
14.	Before starting a job would you prefer:	a. To spend time planning the work? b. To think things out briefly and then start? c. To get started as soon as possible and think as you go along?
15.	Many jobs have to be done to a certain standard. Would you prefer:	a. Always to be responsible for checking that your work is up to standard? b. Occasionally to have someone else to check it? c. Always to have it checked by someone else?
16.	How complicated would you like your work to be?	a. Very complicated needing a lot of thought b. Slightly complicated c. All straightforward and easy to understand
17.	Some jobs are required to be done by a certain time. Would you like to work to a deadline:	a. Most of the time? b. Sometimes? c. Rarely?
18.	When you have a job to do would you prefer to:	a. Work quickly? b. Take your time?
19.	How long would you like to work at the same task?	a. One day or less b. About one week c. More than a week
20.	Would you mind if your work involved rectifying mistakes made by other people?	a. Not at all b. A little c. Quite a lot

No.	Question	Answer
21.	If your job involved making articles, would you prefer them to be?	a. Beautiful? b. Useful?
22.	If you had to make a number of articles would you prefer:	a. To take time and make them to a high standard? b. To make them quickly to an acceptable standard?
23.	Would you mind if your hands got dirty?	a. Not at all b. A little c. Yes
24.	Some work places have to be kept spotlessly clean. Would you prefer:	a. To work in very clean surroundings? b. To work where you do not have to worry about keeping things clean?
25.	Some work places are very noisy. Do you think:	a. You could get used to the noise and it would not bother you? b. You could get used to the noise but you would not like it? c. You could not get used to the noise?
26.	Some work places are very cold. Do you think :	a. You could stand excessive cold very well? b. You could stand excessive cold for short periods? c. You could not stand excessive cold at all?
27.	Some work places are very hot. Do you think :	a. You could stand excessive heat very well? b. You could stand excessive heat for short periods? c. You could not stand excessive heat at all?
28.	Some jobs have to be done where there are lots of fumes and smells. Do you think:	a. It would not affect you? b. You would get used to them in time? c. You would not be able to work there?
29.	When you are working would you prefer to:	a. Sit most of the time? b. Stand most of the time?
30.	Some jobs are underground. Do you think:	a. You would not mind working underground? b. You would not mind working underground some of the time? c. You would prefer not to work under-

No.	Question	Answer
31.	When you are working would you prefer to:	a. Stay in one position (e.g. sitting or standing) most of the time? b. Keep changing position or walking round a lot of the time?
32.	Some work has to be done away from a factory, or office, often at a customer's premises. Would you prefer:	a. To do this kind of work? b. To work within an office or factory?
33.	If you had to work somewhere in cramped and confined conditions would you mind?	a. Not at all b. A little c. Yes
34.	Some jobs have to be done in an uncomfortable position. Do you think:	a. You would not be willing to take a job like that? b. You would not mind being uncomfortable some of the time? c. It would not worry you?
35.	If it were necessary to work outside in wet weather, would you mind?	a. Not at all b. A little c. A good deal
36.	What are your feelings about working above the ground?	a. You would dislike working at heights b. You would not mind working a short distance above the ground c. You would be happy working at any height
37.	Where would you prefer to work if you had a choice?	a. Indoors most of the time b. Outdoors most of the time
38.	Would you mind working where there was some risk of an accident?	a. Not at all b. A little c. A good deal
39.	How would you feel about a job which involved a lot of heavy lifting?	a. You would not like it at all b. You would not mind doing some heavy lifting c. It would not worry you
40.	In some jobs you have very little contact with other people. Would you prefer:	a. To be on your own a lot of the time? b. To have a lot of contact with other people?

No.	Question	Answer
41.	In your day to day work would you prefer to be:	a. Mostly in contact with the general public? b. Occasionally in contact with the general public? c. Mostly in contact with your workmates only?
42.	Although your work may not require public contact, would you mind if the public could see you at work?	a. You would prefer not to be seen by the public b. It would not worry you to be seen by the public
43.	Would you prefer to work with:	a. Mainly people of the same sex as yourself? b. People of both sexes? c. Mainly people of the opposite sex?
44.	Would you prefer to work with people who are:	a. Mostly of the same age group as you? b. Of a different age group from you?
45.	Some jobs involve working with people from other countries. would you prefer:	a. To work only with local people? b. To work with a mixture of local and foreign people?
46.	If you had a choice would you prefer to work:	a. In a large room with more than 15 people? b. In a room with 6-15 people? c. With less than 6 people?
47.	If there is a large amount of work to do with unlimited time would you prefer:	a. To do all the work yourself? b. To share the work with one or two others? c. To share the work with a larger group?
48.	In some jobs the organisation of the work is the responsibility of a supervisor. Would you prefer	a. To organise your own work? b. To have your work organised for you?
49.	In many firms there are training schemes and trade advancement tests. Would you like to have a job:	a. Where you have to get more qualifications whilst working? b. Where you would not need any further qualifications?

Answer Sheet

CONFIDENTIAL

DATE: _____

SURNAME: _____

FIRST NAME(S): _____

_____

AREA .....

COLLIERY:
(if known) .....

.....

1	a. ☐ b. ☐ c. ☐	10	a. ☐ b. ☐	18	a. ☐ b. ☐	26	a. ☐ b. ☐ c. ☐	34	a. ☐ b. ☐ c. ☐	42	a. ☐ b. ☐
2	a. ☐ b. ☐	11	a. ☐ b. ☐ c. ☐	19	a. ☐ b. ☐ c. ☐	27	a. ☐ b. ☐ c. ☐	35	a. ☐ b. ☐ c. ☐	43	a. ☐ b. ☐ c. ☐
3	a. ☐ b. ☐ c. ☐	12	a. ☐ b. ☐ c. ☐	20	a. ☐ b. ☐ c. ☐	28	a. ☐ b. ☐ c. ☐	36	a. ☐ b. ☐ c. ☐	44	a. ☐ b. ☐
4	a. ☐ b. ☐	13	a. ☐ b. ☐ c. ☐	21	a. ☐ b. ☐	29	a. ☐ b. ☐	37	a. ☐ b. ☐	45	a. ☐ b. ☐
5	a. ☐ b. ☐	14	a. ☐ b. ☐ c. ☐	22	a. ☐ b. ☐	30	a. ☐ b. ☐ c. ☐	38	a. ☐ b. ☐ c. ☐	46	a. ☐ b. ☐ c. ☐
6	a. ☐ b. ☐	15	a. ☐ b. ☐ c. ☐	23	a. ☐ b. ☐ c. ☐	31	a. ☐ b. ☐	39	a. ☐ b. ☐ c. ☐	47	a. ☐ b. ☐ c. ☐
7	a. ☐ b. ☐	16	a. ☐ b. ☐ c. ☐	24	a. ☐ b. ☐	32	a. ☐ b. ☐	40	a. ☐ b. ☐	48	a. ☐ b. ☐
8	a. ☐ b. ☐ c. ☐	17	a. ☐ b. ☐ c. ☐	25	a. ☐ b. ☐ c. ☐	33	a. ☐ b. ☐ c. ☐	41	a. ☐ b. ☐ c. ☐	49	a. ☐ b. ☐
9	a. ☐ b. ☐ c. ☐										

Examples:

A. a ☐ b ☐

B. a ☐ b ☐ c ☐

UNDERGROUND
MINEWORKERS

1

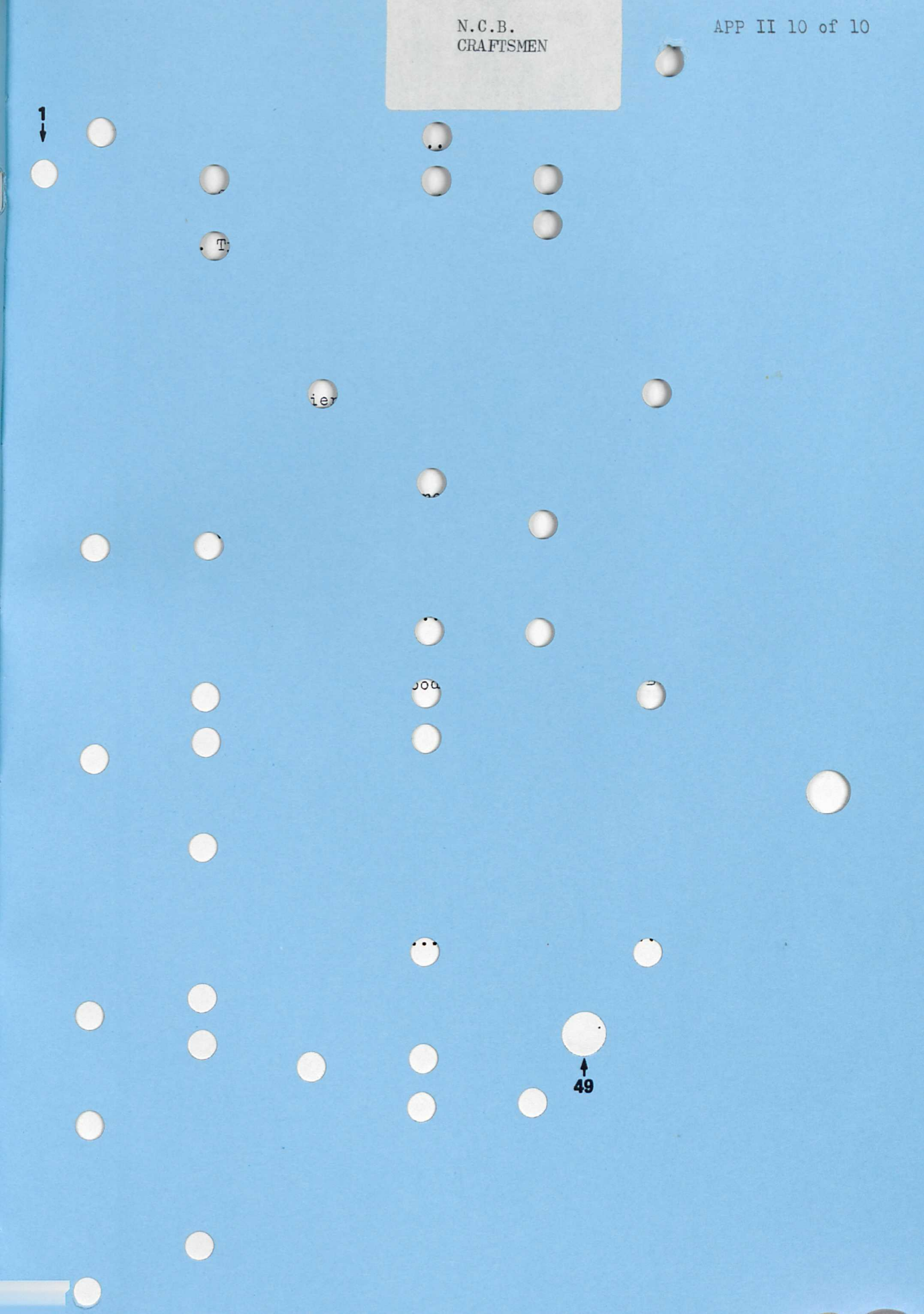
49

N C B

YOUNG OFFICIALS

1

49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49

Quarterly Report Form

1. Name of Trainee:.....

2. Colliery:.....

3. Type of Trainee:.....

4. Period covered by this report - From:..... To:.....

5. Where the period covered by this report was spent.
(Please tick appropriate box or boxes)

Colliery
Training Centre
Technical College

6. Absences during the report period.
(Number of days)

Voluntary .....
Accident .....
Sick .....

7. General Progress.

Very Good Good Average Below Average Poor

8. Types of work undertaken in the report period.
(In the order of the most time spent in each job)

1. .....
2. .....
3. .....
4. .....

9. Any other comments.

General Population Sample - Composition

Cambridgeshire Young Workers = 309 Males + 244 Females

Work Groups Included :-

Aircraft Instrument Engs.	Gardeners
Arc Welders	Lab. Technicians
Bank Clerks	Milkrounds people
Bricklayers	Milling Setting Ops
Bus Drivers	Motor Vehicle Mechs
Butchers	Nurses
Carpenters	Painters & Decorators
Cashiers/Sales Asstnts	Plumbers
Centre Lathe Ops	Policemen/women
Chefs	Secretaries
Clerical Workers	Sewing Machinists
Divers	Sheet Metal Workers
Electrical Trades	Shipyard Workers
Eng. Maintnce Fitters	Telephonists
Food Packers	Toolmakers
Forest Workers	Visual Disply Unt Ops
Hairdressers	Waitresses

The young worker response patterns were obtained by weighting the responses of each working group according to the proportion of workers in that job. Thus the pattern is that of the "average young worker" in the region (I.T.R.U. An Introduction to The Job Disposition Questionnaire and Jobmatch 1982).

Underground Mineworker Profile - J.D.Q. Items

Preference

1b To use power driven tools, hand controlled
3b Medium sized jobs (1 - 5ft)
6a To write own reports
10b To switch jobs with others for variety and experience
11b To do several parts of a job
13bc Some variety/Regular routine
15ac To check own work
19ac Task to last one day or less/more than one week
21b To make useful articles
23a Would not mind getting hands dirty
24b Not to have to keep things clean
26b Could stand excessive cold for short periods
27a Could stand excessive heat very well
28b Could get used to fumes and smells
29b To stand most of the time
30a Would not mind working underground
32a To work away from office or factory
33a Would not mind cramped and confined conditions
34b Would not mind uncomfortable positions
37b To work outdoors most of the time
38a Would not mind accident risk
39c Heavy lifting would not worry you
41c To be mostly in contact with workmates only
43a To work mainly with people of same sex as myself

Suggested cut off 0 - 13/14 - 24

Young Officials Profile - J.D.Q. Items

	Preference
2a	To make things that have to be very exact
6a	Prefer to write reports themselves
9c	Prefer a job with hardly any maintenance and repair work
10a	To become an expert on one or two jobs
14a	To plan work before starting
15b	Occasionally have someone else to check work
16a	Like very complicated work needing a lot of thought
24a	To work in very clean surroundings
25b	Could get used to noise but would not like it
26c	Could not stand excessive cold at all
37a	Prefer to work indoors most of the time
48a	Prefer to organise own work
49a	Like to get more qualifications whilst working

Suggested cut off 0 - 5/6 - 13

Craftsman Profile - J.D.Q. Items

Preference

1a To work with hand tools

4a Prefer to do own work calculations

6a To write own reports

8b Prefer making or constructing new things some of the time

9a Prefer a good deal of maintenance and repair work

10b Prefer to switch jobs for experience and variety

11a To do all various parts of a job themselves

13a Prefer a great deal of variety

14ab To spend time planning/to think things out briefly then start

15a Always be responsible for checking own work

16ab Like very complicated work needing lot of thought/ slightly complicated

17c Rarely like to work to a deadline

20a Do not mind rectifying others mistakes

25b Could get used to noise but would not like it

26ab Could stand excessive cold well/for short periods

28b Could get used to fumes and smells

29b Prefer to stand most of the time

30ab Would not mind working underground/some of the time

32a To do work away from a factory

33ab Would not mind cramped conditions at all /a little

34bc Would not mind being uncomfortable/some of the time

36c Would be happy working at any height

37b Prefer to work outdoors most of the time

41a Prefer to be mostly in contact with general public

44a Work with mostly same age group

46c Prefer to work with less than six people

48b To have work organised for them

Suggested cut off 0 - 15/16 - 27

Table of scores against Underground Mineworker Profile

Group	No.	Mean	S.D.	% of group scoring:-	
				14-24	0-13
Underground Miners	200	15.36	2.45	79.3	20.7
Forestry Workers	183	13.32	2.64	46.4	53.6
Farming & Agrclture	60	12.75	1.94	30.0	70.0
Fork Lft Trck Drvrs	27	12.04	2.38	25.9	74.1
Bricklayers	68	11.78	2.27	23.5	76.5
Carpenters	73	11.64	2.58	21.9	78.1
Painters & Decrtrs	29	11.55	2.68	27.6	72.4
Motor Vehicle Mechs	109	11.38	2.03	12.8	87.2
Chefs	47	11.15	2.59	17.0	83.0
Retail Selling	27	11.07	3.04	18.5	81.5

SCORES AGAINST UNDERGROUND MINEWORKER PROFILE

GENERAL WORKERS SAMPLES

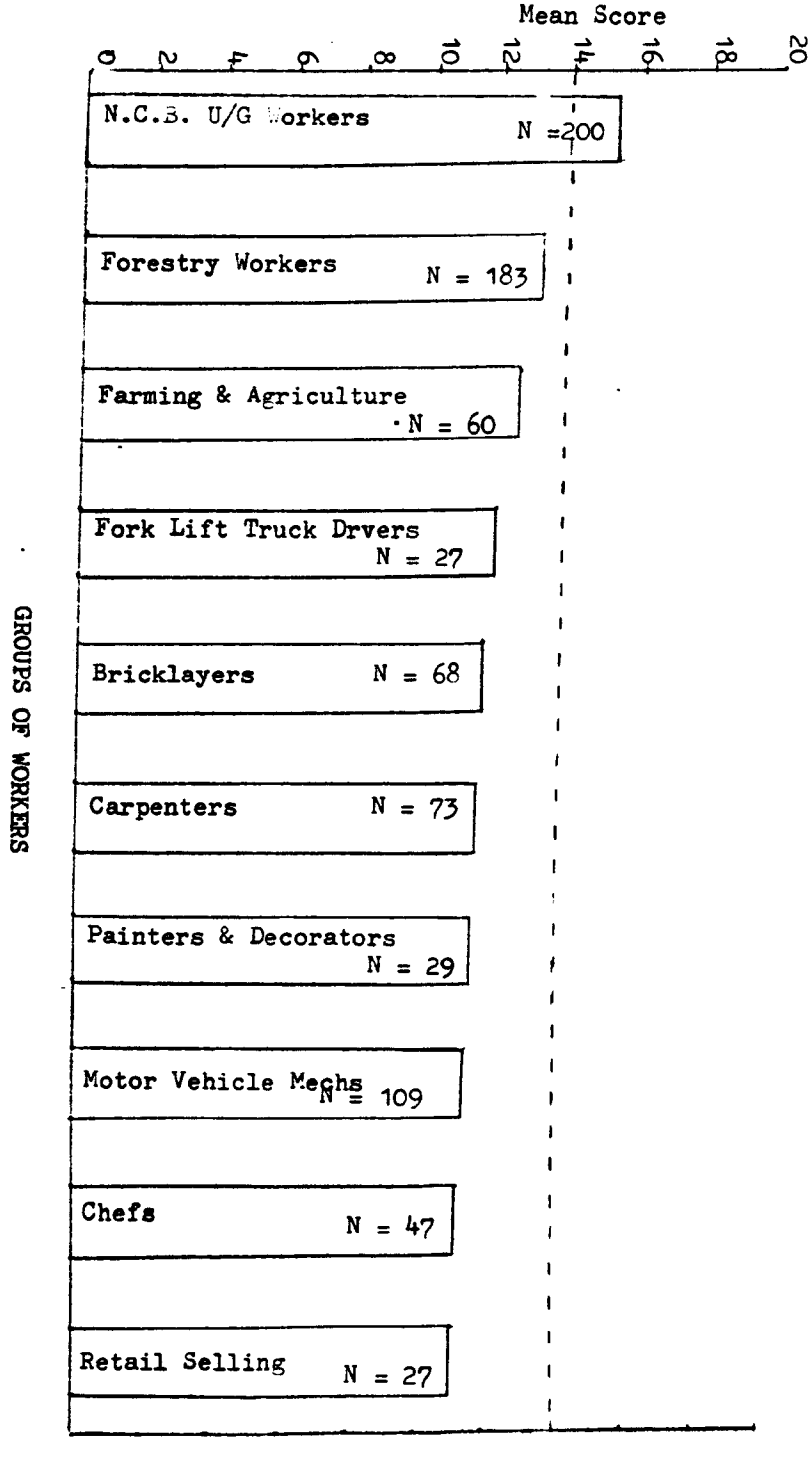


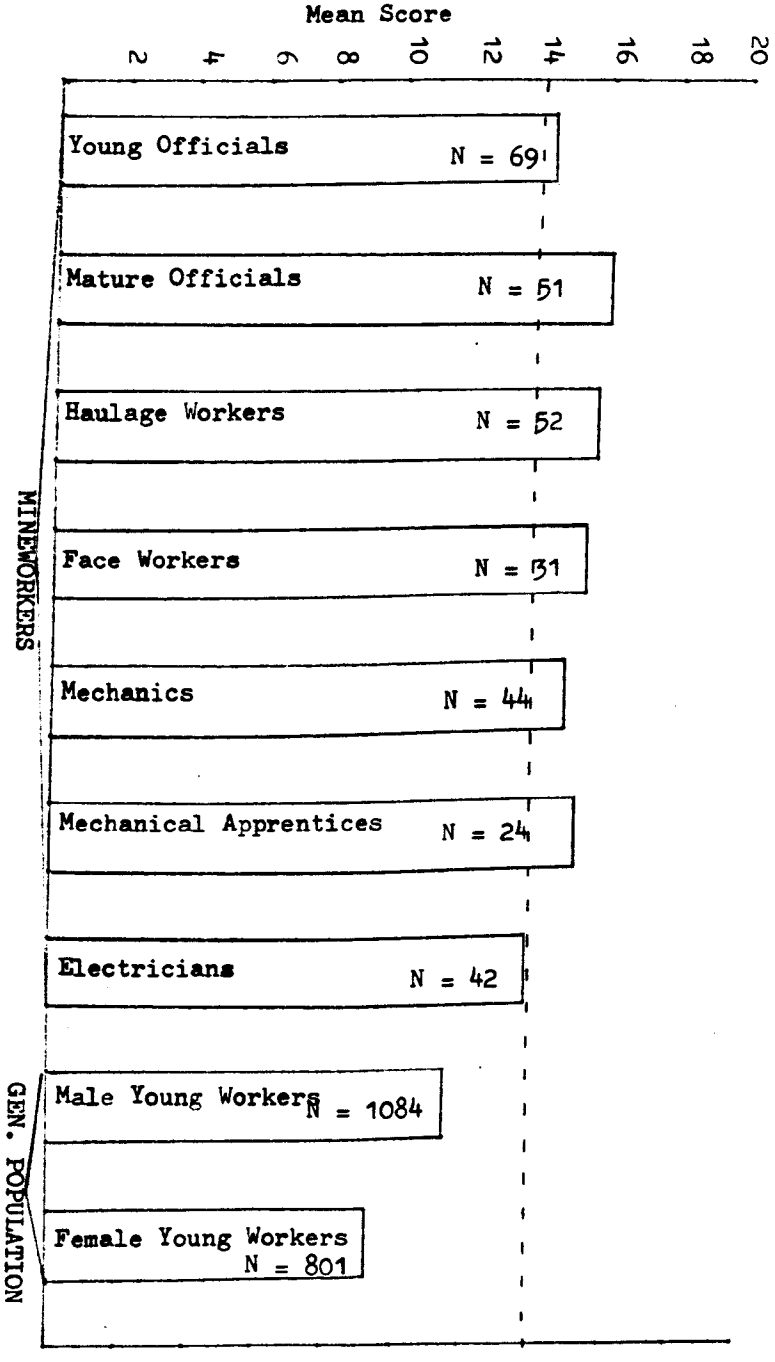
Table of scores against Underground Mineworker Profile

Group	No.	Mean	S.D.	% of group scoring:-	
				14-24	0-13
Underground Miners	200	15.36	2.45	79.3	20.7
NCB Young Officials	69	14.38	2.83	65.2	34.8
NCB Haulage Workers	52	15.73	2.22	84.6	15.4
NCB Face Workers	31	15.42	2.54	80.6	19.4
NCB Mechanics	44	14.84	1.94	72.7	27.3
NCB Electricians	42	13.69	3.08	52.4	47.6
NCB Mature Offcls	51	16.02	2.59	86.3	13.7
NCB Welsh Mech. Apps	24	15.25	1.87	91.7	8.3
Male Young Workers	1084	11.46	2.67	23.0	77.0
Female Young Wrkrs	801	8.91	2.76	4.9	95.1

The NCB Mature Officials sample and the Welsh Mechanical Apprentices sample were obtained by the I.T.R.U. for other projects but they were appropriate here.

SCORES AGAINST UNDERGROUND MINEWORKER PROFILE

MINING SUBSAMPLES



Trainability Test

Reports after six months training

Trainee	Trainability Test		End Test	Job Progress
	Errors	Rating		
1	1	A	82.5	Good
2	1	A	82.5	Good
3	1	A	81	Good
4	2	A	84	Good
5	2	A	81	Average
6	2	A	80	Very good
7	2	A	80	Very good
8	3	A	79	Below ave.
9	4	B	75	Good
10	4	A	70	Left
11	5	B	82.5	Good
12	5	B	79	Good
13	5	B	79	Average
14	6	C	86	Poor
15	6	C	85	Good
16	6	C	80	Good
17	6	C	73	Average
18	6	C	69	Average
19	7	C	88	Good
20	7	C	86	Very good
21	7	C	85	Very good
22	7	C	84	Good
23	7	C	83	Good
24	7	C	82.5	Good
25	7	C	79	Good
26	7	C	72	Average
27	8	D	84	Average
28	8	C	79	Very good
29	9	D	90	Very good
30	9	D	88	Good
31	9	D	83	Good
32	10+	E	83	Average
33	10+	E	81	Poor
34	10+	E	73	LEFT
35	10+	D	70	Poor
36	10+	E	69	Poor
37	10+	E	68	Average

These are two examples of the school reports held in the personal records of trainees.

"Comments - Garry is above average intelligence but he has not relly applied himself to his studies and gained the maximum from them. He is an unachiever who will, I am sure, progress more quickly when placed in the work environment He is a very capable sportsman who has represented the School at soccer."

"Attitude to work	- little effort or enthusiasm
Ability to concentrate	- Erratic. Can concentrate but not often
Ability to work	- Gets on well with others
Ability to use own initiative	- Not shown much sign
Punctuality	- Good
Attendance	- Very good
Conduct	- Never been in serious trouble and some staff commend his co-operation. Has a tendency to dumb insolence."

Quarterly Absence & Progress — Passed on Three Tests — Page1

Personal Code	Test Scores	1st Quarter				2nd Quarter				3rd Quarter				4th Quarter				5th Quarter				6th Quarter			
	m c o	v	a	s	p	v	a	s	p	v	a	s	p	v	a	s	p	v	a	s	p	v	a	s	p
Mining																									
11005	16 16 7	0	0	0	3	1	0	0	3	4	0	0	3	2	0	0	3	0	0	0	4	2	0	0	4
12014	15 19 6	0	0	0	2	2	0	0	2	0	0	0	2	0	0	0	2	0	0	0	3	0	0	10	2
12017	15 18 7	3	0	0	2	3	0	0	2	0	0	4	2	9	0	13	2	7	0	0	3	11	0	12	2
23112	14 17 8	6	0	0	2	3	0	0	2	2	0	0	3	3	0	2	2	0	0	0	3	4	0	2	3
24127	16 18 8	2	0	0		2	0	0		1	0	0		3	0	0		0	0	0		1	0	0	4
25129	14 19 6	0	0	5	3	0	0	0	3	0	0	0	3	0	0	0	3	1	0	0	3	3	0	0	3
25134	21 16 6	0	0	0	3	3	0	0	3	0	0	0	3	2	0	0	3	0	0	0	4	0	0	0	4
27144	15 18 6	0	0	0	4	0	0	0	4	0	0	0	4	0	0	0	4	2	0	0	3	0	0	0	4
27149	16 21 6	2	0	0	4	2	0	0	4	0	0	5	3	0	0	0	4	0	0	4	3	0	0	0	4
32162	14 17 7	3	0	2	2	2	0	2	2	4	0	0	2	8	0	0	2	5	0	0	2	6	0	3	2
33172	16 16 7	0	0	5	2	0	0	10	2	1	0	0	3	1	0	0	3	1	0	0	3	0	0	0	2
M.Craft																									
17071	18 18 7	1	0	0	3	0	0	0	2	0	0	0	3	0	0	0	3	1	0	0	2	2	0	0	3
23113	18 17 6	1	0	0	3	2	0	0	4	0	0	0	3	0	0	0	4	0	0	0	4	0	0	0	4
23116	14 17 7	0	0	0	3	0	0	0	3	1	0	0	3	0	0	0	4	0	0	0	4	1	0	0	4
27150	16 16 6	0	0	0	3	0	0	0	4	0	0	0	4	2	0	0	4	0	0	0	4	0	0	4	4
31154	18 17 7	3	0	3	3	0	0	6	3	0	0	4	3	3	0	1	3	2	0	10	3	0	0	1	3
33178	16 18 6	2	0	0	2	3	0	6	3	2	0	0	3	8	0	0	3	2	0	0	2	7	0	0	1
Engnrng																									
13030	18 18 6	0	0	0	4	1	0	0	4	1	0	0	4	2	0	0	4	1	0	0	4	0	0	23	4
14044	16 17 7	0	0	0	3	0	0	0	3	0	0	0	3	0	0	0	3	0	0	0	2	2	0	0	3
14045	19 17 6	0	0	0	3	3	0	0	3	0	0	0	3	0	0	0	3	1	0	0	3	6	0	11	3
15055	17 17 7	0	0	0	3	0	0	0	4	0	0	0	4	0	0	0	4	1	0	0	4	0	0	0	4
16068	18 17 6	0	0	0	3	0	0	0	3	0	0	0	3	0	0	0	3	2	0	0	2	1	0	0	3

Quarterly Absence & Progress Passed for Discipline Page1

Personal Code	Test Scores			1st Quarter				2nd Quarter				3rd Quarter				4th Quarter				5th Quarter				6th Quarter			
	m	c	o	v	a	s	p	v	a	s	p	v	a	s	p	v	a	s	p	v	a	s	p	v	a	s	p
Mining																											
11002	16	15	4	0	0	0	3	7	0	0	2	10	0	0	2	3	0	5	2	12	0	0	1	6	0	3	1
11003	14	16	1	0	0	0	3	1	0	0	3	3	0	10	3	4	0	5	2	2	0	0	3	0	0	0	4
11006	18	15	6	5	0	0	3	2	0	0	2	6	0	0	2	4	0	0	2	0	0	40	2	6	0	10	2
12018	14	16	4	0	0	0	2	1	0	11	3	0	0	10	3	0	0	5	3	0	0	0	4	0	0	0	4
12020	15	13	2	1	0	0	2	4	0	0	2	5	0	4	2	6	0	3	2	6	0	0	2	0	0	6	2
13025	18	16	4	2	0	0	4	0	0	0	4	1	0	0	3	2	0	0	4	3	0	30	4	1	0	0	4
13026	15	14	4	1	0	0	3	1	0	0	4	1	0	0	3	4	0	0	3	4	0	0	3	4	0	0	3
13027	15	16	3	1	0	1	2	1	0	0	4	0	0	0	4												
14031	18	17	5	2	0	0	2	1	0	0	2	3	0	0	2	5	0	0	2	4	0	0	2	13	0	0	1
14035	19	15	7	2	0	0	2	0	0	5	2	2	0	0	2	3	0	0	2	3	0	5	1	6	0	7	1
15052	17	14	4	2	0	0	2	2	0	0	3	2	0	0	3	2	0	10	2	1	0	0	2	1	0	0	3
16057	14	14	5	1	0	0	2	3	0	0	2	10	0	0	2	6	0	0	1	4	0	0	2	6	0	9	3
16062	15	14	3	0	0	0	4	1	0	0	3									4	0	15	2	3	0	5	2
16064	18	13	2	0	0	0	3	0	0	0	3	0	0	16	3	0	0	0	4	4	0	0	3	1	1	3	3
16065	16	16	1	0	0	0	3	2	0	3	2	1	0	0	2	1	0	0	1	5	0	10	2	3	0	0	2
18081	14	16	5	1	0	0	3	1	0	0	3	1	0	0	3	0	0	0	3	0	0	0	3	0	0	0	2
18083	16	17	4	0	0	0	3	0	0	0	3	0	0	0	4	0	0	2	3	0	0	0	4	0	0	0	4
18084	16	13	4																								
21086	16	14	5	8	0	0		4	0	15		2	0	0		4	0	0		3	0	4	3	0	0	45	
21087	16	9	5	0	0	3		3	0	0		0	0	0		1	0	0		4	0	3		1	0	5	4
21092	16	12	4	0	0	0		1	0	0		0	0	0		0	0	0		0	0	0		1	0	0	4
21093	17	14	5	2	0	0		1	0	0		0	0	0		4	0	0		7	0	0		6	0	0	3
21094	14	14	2	0	0	0		0	0	0		4	0	0		1	0	0		1	0	0		1	0	0	3
22101	17	11	4	1	0	0	2	2	0	0	3	0	0	0	4	0	0	1	4	1	0	15	4	0	0	60	
22102	15	13	5	0	0	0	4	0	0	6	3	0	0	0	3	1	0	0	3	0	0	0	3	0	0	0	3
23105	18	14	5	0	0	0	4	0	0	0	3	0	0	0	4	0	0	1	4	1	0	0	3	0	0	0	3
23107	14	12	2	2	0	0	3	1	0	0	3	3	0	0	3	4	0	14	2	1	0	2	3	5	0	0	3
23108	17	19	5	3	0	0	3	0	0	0	3	0	0	0	4	5	0	2	3	2	0	0	3	0	0	11	3
23109	15	16	5	3	0	10	4	2	0	0	3	3	3	9	2	6	0	10	3	5	0	4	3	0	0	0	3
23110	15	14	4	0	0	0	4	1	0	10	3	0	0	0	3	0	0	11	3	0	0	1	4	0	0	16	4
23111	16	17	5	2	0	0	3																				
24118	18	11	6	16	0	0		6	0	0		5	0	0		10	0	0	0								
24119	17	16	3	1	0	12		4	0	6		2	0	7		1	0	6		4	0	5		3	0	0	2
24121	17	13	7	0	0	0		2	0	0		1	0	0		0	0	3		0	0	22		0	0	3	
24123	21	17	4	2	0	0		1	0	0		0	0	3		0	0	22		0	0	3		2	0	4	3
24126	20	18	5	0	0	0		1	0	0		9	0	0		1	0	6		4	0	5		4	0	5	3
25130	19	14	2	0	0	0	3	0	0	0	3	1	0	5	3	2	0	0	3	4	0	0	3	2	0	0	3
25131	20	17	4	0	0	0	2	0	0	0	3	0	0	4	3	5	0	13	1	4	0	0	1	1	0	0	2
25132	17	13	5	2	0	0	3	2	0	0	3	2	0	0	4	3	0	0	4	3	0	0	4	2	0	0	4
25133	20	16	5	0	0	0	3	0	0	0	4	0	0	0	4	2	0	0	4	1	0	0	4	2	0	0	4
26137	14	16	3	6	0	0	2	2	0	0	2	2	0	5	1	5	1	5	3	8	0	0	2	4	0	0	2

Quarterly Absence & Progress

Passed for Discipline

Personal Code	Test Scores			1st Quarter				2nd Quarter				3rd Quarter				4th Quarter				5th Quarter				6th Quarter			
	m	c	o	v	a	s	p	v	a	s	p	v	a	s	p	v	a	s	p	v	a	s	p	v	a	s	p
Mining																											
26138	18	15	5	2	0	0	2	1	0	5	2	1	2	0	2	2	1	0	2	2	0	0	2	3	0	0	2
26139	18	13	2	17	0	33	0	0	0	65		9	2	0	1	0	0	60		3	0	25		5	0	8	
26140	18	15	2	4	0	0	2	2	0	0	2	5	1	0	3	1	0	0	3	5	0	0	3	5	0	0	3
26141	17	17	3	0	0	0	2	0	6	0	2	0	7	1	3												
27145	14	18	4	0	0	0	2	0	0	0	2	0	0	5	2	2	0	0	3	0	0	10	2	3	0	0	3
27146	17	15	2	0	0	0	3	0	0	0	3	2	0	0	3	2	0	0	3	1	0	3	3	2	0	0	3
27147	15	15	4	0	0	0	4	0	0	0	4	0	0	5	4	0	0	20	4	1	0	0	4	0	0	0	4
31153	16	14	5	0	0	0	3	0	0	0	3	1	0	0	3	0	0	0	3	0	0	0	3	0	0	0	3
32156	16	14	1	2	0	5	2	2	0	0	2	4	0	3	2	1	0	0	3	0	0	0	3	0	0	0	3
32157	18	14	7	3	0	0	2	0	0	24	2	3	0	0	2	0	0	0	3	2	0	0	3	1	0	0	2
32158	19	17	4	1	0	0	2	8	0	0	2	0	0	0	2	2	0	0	3	1	0	10	2	2	0	5	2
32159	14	14	6	1	0	2	3	4	0	0	3	1	0	0	3	3	0	0	3	3	0	7	2	3	0	0	2
32160	14	14	4	0	0	2	3	0	0	0	3	3	0	0	2	0	0	5	2	1	0	0	3	3	0	0	3
32161	14	16	3	0	0	2	3	3	0	0	3	5	0	0	3	3	0	0	3	0	0	40	2	1	0	11	2
32163	14	13	2	0	0	0	3	0	0	0	2	0	0	0	2	2	0	0	2	0	0	0	3	0	0	0	2
33166	16	15	6	2	4	0	2	3	0	0	2	3	0	4	3	9	0	5	2	6	0	4	3	4	0	5	3
33167	18	17	3	2	0	0	2	5	0	8	2	0	0	5	3	3	0	2	3	4	0	0	3	3	0	45	3
33169	16	16	3	5	0	0	2	4	0	0	3	4	0	0	3	0	0	0	2	8	0	0	2	2	0	5	2
33170	18	14	3	2	0	0	2	1	0	0	3	4	0	0	3	4	0	0	3	1	0	0	3	0	0	0	4
33174	15	14	3	2	0	0	2	1	0	0	3	1	0	0	4	1	0	4	3	1	0	0	2	1	0	0	2
33175	14	11	7	0	0	0	2	2	0	0	3	1	0	27	3	6	0	7	3	6	0	0	3	6	0	0	2
M.Craft																											
13022	14	12	7	0	0	0	3	2	0	0	4	0	0	0	3	1	0	0	3	0	0	0	3	0	0	0	3
14036	14	14	6	2	0	0	3	0	0	0	3	0	0	0	3	0	0	0	3	2	15	0	3	2	0	0	3
16058	16	13	7	0	0	0	4	3	0	0	3	3	0	15	2	1	0	12	2	5	0	5	3	6	0	0	3
23114	17	15	6	0	0	0	4	0	0	0	3	0	0	0	3	1	0	0	3	1	0	0	3	1	0	0	3
25135	16	15	7	0	0	0	3	0	0	0	3	0	0	0	3	1	0	0	3	0	0	0	3	1	0	0	3
26142	14	15	7	0	0	0	2	0	0	0	2	0	0	0	4	0	0	0	4	0	0	0	4	0	0	0	4
21096	14	15	6																								
21097	14	12	8																								
21098	14	14	8	9	0	0		3	0	0		6	0	0		4	0	10		11	0	0		8	0	0	2
Engnrng																											
11010	16	19	5	4	0	10	3	2	0	0	2	2	0	10	2	5	0	5	2	7	0	0	2	3	0	4	2
11011	18	19	4	2	0	0	3	0	0	0	3	0	0	0	3	0	0	0	3	1	0	5	3	0	0	0	3
14050	16	16	5	1	0	0	2	0	0	0	2	2	0	0	3	5	0	0	3	2	0	26		5	0	0	2
15056	17	16	3	1	0	0	3	1	0	0	3	0	0	0	3	0	0	0	3	3	0	0	3	2	0	0	3
18085	17	17	5	5	0	5	3	0	0	0	3	0	0	0	4	1	0	0	4	0	0	0	3	0	0	0	3

Quarterly Absence & Progress Failed for Discipline Page1

Personal Code	Test Scores			1st Quarter				2nd Quarter				3rd Quarter				4th Quarter				5th Quarter				6th Quarter			
	m	c	o	v	a	s	p	v	a	s	p	v	a	s	p	v	a	s	p	v	a	s	p	v	a	s	p
M.Craft																											
13023	17	17	5	0	0	0	3	3	0	0	4	4	0	0	4	2	0	0	3	4	0	0	3	1	0	0	3
14032	14	17	3	4	0	0	2	0	0	0	2	1	0	0	3	2	0	0	2	6	0	0	2	2	0	0	2
17072	16	18	5	1	0	0	3	0	0	5	3	2	0	0	3	1	0	0									
18082	15	13	5	7	0	16	2	2	0	4	2	3	0	5	2	2	0	5	2	2	0	0	2	2	0	0	2
21095	19	18	3	0	0	0		0	0	0		0	0	0		4	0	0		3	0	0		5	0	0	2
22104	20	26	4	0	0	0	3	0	0	0	2	0	0	5	2	0	0	0	2	0	0	0	2	0	0	0	2
24128	17	17	4	2	0	0		2	0	0		4	0	2		4	0	0		5	0	0		1	0	5	1
26143	14	18	4	0	0	0	2	0	0	0	2	1	0	0	4	2	0	0	4	2	0	0	4	2	0	0	4
27151	19	14	5	0	0	0	4	0	0	0	4	0	0	0	3	0	0	0	4	0	0	0	4	0	0	0	4
32164	19	16	5	3	0	0	3	0	0	0	2	3	0	0	3	4	0	0	2	3	0	0	2	2	0	0	2
32165	18	17	4	8	0	7	2	8	0	0	2	9	0	0	1	2	0	0	2	3	0	0	2	2	0	0	3
33177	17	14	4	0	0	0	2	1	0	11	2	3	0	28	3	6	0	3	3	2	0	12	3	4	0	0	3
34179	17	16	3	0	0	0	3	0	0	0	3	0	0	0	3	0	0	0	2	0	0	0	2	0	0	0	2
Engnring																											
13029	15	15	5	0	0	0	3	0	0	0	4	1	0	0	4	1	0	0	4	1	0	0	4	0	0	0	4
14049	14	14	4	1	0	0	2	1	0	10	2	0	0	0	3	3	0	13	2	1	0	0	3	1	0	8	2
14051	16	13	5	0	0	0	2	1	0	0	3	5	0	0	1	0	0	0	2	2	0	0	1	5	0	5	3

Quarterly Absence & Progress — Failed for Mining — Page1

Personal Code	Test Scores			1st Quarter				2nd Quarter				3rd Quarter				4th Quarter				5th Quarter				6th Quarter			
	a	c	o	v	a	s	p	v	a	s	p	v	a	s	p	v	a	s	p	v	a	s	p	v	a	s	p
Mining																											
11001	13	9	6	0	0	0	3	0	0	0	3	0	0	5	3	4	0	0	2	26	0	10	0	4	0	5	1
11007	13	15	4	0	0	0	3	0	0	0	4	0	0	0	4	0	0	0	4	0	0	0	4	0	0	0	4
11009	13	14	8	0	0	0	3	3	0	0	2	7	0	0	2	3	0	0	2	8	0	0	1	5	0	0	2
12016	9	10	7	0	0	0	3	0	0	0	3	1	0	0	4	0	0	0	4	0	0	0	4	0	0	0	4
12019	11	14	5	0	0	0	2	4	0	0	2	10	0	0	2	4	0	0	2	3	0	0	2	5	0	2	2
12021	11	11	5	1	0	0	3	3	0	0	2	5	0	8	2	23	0	10	1	5	0	15	1	8	0	53	1
13024	11	14	4	1	0	0	2	1	0	1	2	3	0	0	2	0	0	0	2	0	0	0	3	1	0	0	3
14033	12	10	6	4	0	15	1	6	0	0	1																
14034	12	15	6	4	0	0	2	2	0	0	2	2	0	10	2												
14039	13	12	2	2	0	0	2	1	0	0	1	1	0	0	2	4	0	0	1	1	0	0	2	4	0	10	1
15053	12	15	7	1	0	0	2	1	0	5	3	3	0	0	2	9	0	0	2	0	0	8	2	0	0	0	3
15054	13	15	4	0	0	0	2	1	0	0	3	0	0	0	2	0	0	0	2	0	0	3	2	0	0	0	2
16061	11	10	6	0	0	0	3	0	0	0	4	0	0	0	3	0	0	0	4	0	0	0	4	0	0	0	4
17074	12	14	7	6	0	5	1	9	0	14	0	8	0	9	0												
17078	9	13	7	0	0	0	2	0	0	6	2	0	0	0	2	0	0	0	3	1	0	0	2	1	0	0	2
18080	12	9	5	0	0	0	2	0	0	0	2	1	0	0	2	1	0	0	3	0	0	0	3	0	0	0	3
21088	11	14	1	14	0	5		9	0	25		0	0	20	0												
21089	13	20	4	2	0	2		1	0	0		2	0	2		1	0	3		2	0	5		1	0	0	3
21090	12	12	7	0	0	0		0	0	0		1	0	0		3	0	0		3	0	0		2	0	0	3
21091	12	10	4	2	0	0		1	0	0		2	0	0		5	0	0		5	0	0		4	0	0	3
22099	12	14	4	0	0	0	1	0	0	0	2	0	0	0	4	0	0	0	4	0	0	0	4	0	0	0	4
22100	12	17	5	2	0	0	2	1	0	0	2	5	0	0	1	4	0	0	1	4	0	12	1	6	0	9	1
22103	12	13	4	0	0	0	2	1	0	0	2	1	0	5	2	2	0	6	2	4	0	0	2	2	0	0	2
23106	12	16	2	7	0	0	4	10	0	0	3	6	0	0	2	1	0	0	3	1	0	0	3	6	0	1	3
24120	13	19	5	4	0	0		4	0	0		3	0	0		4	0	4		3	0	5		3	0	0	3
24122	11	15	5	1	0	0		1	0	0		0	0	5		5	0	7		1	0	0		0	0	0	1
27148	9	15	7	0	0	0	2	0	0	0	2	3	0	5	2	0	0	0	2	1	0	0	4	1	0	10	4
32155	11	13	5	0	0	4	3	2	0	0	2	4	0	1	2	7	0	0	2	3	0	0	2	5	0	1	3
33168	13	16	7	0	0	9	2	1	0	0	3	2	0	3	3	4	0	1	2	3	0	0	1	3	0	0	2
33171	13	16	5	3	0	5	2	4	0	0	2	5	0	0	2	2	0	8	2	2	0	0	2	3	0	5	2
33173	10	13	8	0	0	0	2	0	0	0	4	0	0	0	4	0	0	0	2	0	0	20	2	0	0	15	2
33176	13	17	7	2	0	1	2	2	0	0	3	0	0	0	3	0	0	0	3	2	0	0	3	0	0	0	4

Quarterly Absence & Progress — Failed for Mining — Page2

Personal Code	Test Scores			1st Quarter				2nd Quarter				3rd Quarter				4th Quarter				5th Quarter				6th Quarter			
	a	c	o	v	a	s	p	v	a	s	p	v	a	s	p	v	a	s	p	v	a	s	p	v	a	s	p
M.Craft																											
11008	13	15	6	0	0	0	4	0	0	0	4	0	0	0	4	0	0	0	4	0	0	0	4	0	0	0	4
12015	10	18	7	0	0	0	2	5	0	0	2																
14037	9	15	10	1	0	0	4	0	0	0	3	0	0	3	3	0	0	0	3	0	0	0	3	1	0	0	3
14038	13	13	6	1	0	0	3	0	0	0	2	2	0	0	2	5	0	0	2	1	0	0	2	0	0	0	1
14041	12	15	6	0	0	0	3	0	0	0	2	0	0	0	3	0	0	0	3	2	0	0	2	1	0	0	2
14042	11	16	9	2	0	0	3	2	0	0	3	5	0	0	2	2	0	0	2	6	0	0	2	3	0	0	3
16059	13	16	6	0	0	0	3	2	0	3	3	15	0	0	1	9	0	0	2	16	0	0	1	6	0	0	1
16060	10	20	8	0	0	0	4	0	0	0	3	1	0	0	3	1	0	11	3	4	0	0	3	1	0	0	3
16063	9	16	7	6	0	2	3	10	0	0	1	22	0	5	1												
17070	10	15	9	1	0	0	4	2	0	0	3	3	0	0	3	2	0	0	2	2	0	0	2	0	0	20	2
17073	13	11	8	1	0	0	3	0	0	0	3	0	0	0	3	0	0	0	2	1	0	0	2	1	0	0	2
17075	13	14	9	2	0	0	4	0	0	0	3	0	0	0	3	0	0	0	3	0	0	0	3	1	0	0	3
17076	10	15	3	0	0	0	3	1	0	0	2	5	0	0	2	1	0	0	2	9	0	0	1	1	12	0	2
17077	13	14	6	0	0	10	2	2	0	0	3	6	0	2	2	6	0	0	1	1	0	4	2	6	0	4	1
23115	12	18	9	1	0	0	4	1	0	0	4	0	0	5	4	0	0	25	4	0	0	0	4	0	0	0	4
27152	13	16	7	0	0	0	2	0	0	0	2	6	0	5	1	1	0	0	2	0	0	0	4	0	0	0	4
Engnrng																											
11012	10	14	8	6	0	10	3	8	0	0	1	5	0	5	2	0	0	0	2	4	0	5	2	4	0	2	2
11013	10	16	5	0	0	0	3	1	0	0	3	2	0	0	3	4	0	5	3	2	0	0	3	4	0	0	3
13028	10	18	9	0	0	4	2	1	0	7	2	0	0	12	2	10	0	0	2	10	0	2	1	24	0	10	0
14043	11	6	7	2	0	0	2	4	0	2	2	1	0	0	1	2	0	0	1	7	0	0	0	0	0	0	1
14046	13	16	6	0	0	5	3	3	0	0	2	0	0	0	3	5	0	0	2	2	0	6	2	1	0	0	2
14047	13	16	4	2	0	0	2	3	0	0	2	0	0	0	3	0	0	0	3	2	0	26	2	1	0	0	3
14048	13	16	5	0	0	0	2	0	0	0	2	0	0	0	3	0	0	0	2	1	0	0	2	1	0	0	3
16066	10	19	9	2	0	0	3	1	0	0	1	8	0	0	1	7	0	5	1	15	0	5	0	12	0	8	0
16069	12	17	4	0	0	0	3	0	0	0	3	0	0	0	4	1	0	0	4	0	0	0	3	0	0	0	3
16067	11	15	4	2	0	0	3	0	0	0	2	1	0	0	2	5	0	5	1	6	0	0	2	2	0	0	2
18079	13	13	5	5	0	0	2	0	0	0	2	0	0	3	2	1	0	0	4	1	0	0	3	1	0	0	3

APPENDIX XI

Part One

English Test

NATIONAL COAL BOARD

SELECTION TESTS

English Test

Section One

Instructions to the candidate.

In each question a word is given in CAPITAL letters, followed by five other words. ONE of these five words means the same, or nearly the same, as the word in CAPITAL letters.

Decide which word it is and write its letter on the answer sheet.

Example

	(a)	(b)	(c)	(d)	(e)
EMULATE	Condemn	Engage	Copy	Embalm	Collaborate

Answer: (c)

Followed by Questions 1 to 25

English Test

Section Two

Instructions to candidate

Each sentence explains the meaning of one of the words identified by letters in brackets. Decide which word it is and write its letter on the answer sheet.

Example

An object which compels the highest admiration is described as:

(a)	(b)	(c)	(d)	(e)
Harmonic	Admonished	Exquisite	Extenuated	Nice

Answer: (c)

Followed by Questions 26 to 45.

English Test

Section Three

Instructions to candidate

Choose the word in brackets which best completes each sentence and write its letter on the answer sheet.

Example

For the museum to identify the spider which Jones had seen, his description of it had to be quite

(a)	(b)	(c)	(d)	(e)
Immaculate	Pacific	Clever	Long	Precise

Answer: (e)

Followed by Questions 46 to 60.

Part Two

Mathematics Test

Mathematics Test

This test contains sixty questions on the following ideas:-

(a) Addition, subtraction, multiplication and division of whole numbers

(b) Addition, subtraction, multiplication and division of decimals

(c) Addition, subtraction, multiplication and division of fractions

(d) Interconversion of decimals and fractions

(e) Percentages

(f) Units of linear measurement. Area of rectangles

(g) Relationship between speed, time and distance

(h) Square roots and cube roots

(i) Algebraic equations containing one unknown

(j) Addition, subtraction and multiplication of algebraic expressions

(k) Area and perimeter of circles and triangles

(l) Pythagoras Theorem

Part Three

Mechanical Comprehension Test

Mechanical Comprehension Test

This test contains questions on basic general science (e.g. melting points, boiling points, oxidation, conduction of heat), as well as simple mechanics. The latter category covers the ideas of gear and pulley ratios, mechanical equilibrium and hydrostatic pressure.

There are twenty questions in all.

Part Four

Electrical Comprehension Test

Electrical Comprehension Test

The final test consists of twenty questions ranging from a simple knowledge of the household electric plug through application of Ohm's Law to practical circuit testing.

A sample of NCB Selection Test Scores

Trainee	Test 1	Test 2	Min	Crft	Offs
26141	39	34	17	17	3
26137	29	28	14	16	3
26138	20	40	18	15	5
26139	20		18	13	2
26140	11		18	15	2
	(Max.60)	(Max.60)			

Only a few of the trainees had these results recorded and those did not relate significantly with the profile scores.

EXTRACT FROM AnCO REPORT

(Industrial Training Authority, Dublin)

SUMMARY

Introduction

JOBMATCH is a recently developed measure of occupational interests for use in careers guidance and counselling. It is intended to identify job or work areas towards which individuals should be well disposed and to steer them clear of those where they would be less happy. An individual's answers to the JOBMATCH questionnaire are compared with likes and dislikes expressed by people in specific occupations to identify those occupations with which the individual has a lot in common. In these occupations, he is more likely to be content and to work well, provided he has the necessary abilities.

This study examined the potential applications of JOBMATCH to AnCO especially as an aid to selection. 348 trainees in a range of courses completed the JOBMATCH questionnaire, and were evaluated by their instructors. Aptitude test results were also available for some of the trainees.

Results

It was shown that JOBMATCH could effectively discriminate between different groups of trainees e.g. welding trainees scored highest on the welder profile, office procedures trainees scored highest on the secretary profile, and so on. This suggests that JOBMATCH is a valid measure of occupational interest. However, the relationship between JOBMATCH scores and instructor ratings was very weak, indicating that occupational interests are not accurate predictors of performance, and are well below the level of accuracy obtained using aptitude tests.

Conclusions

It is recommended that JOBMATCH should not be used in making selection decisions about trainees, but that it has considerable potential as an aid to career planning and guidance. Optimum use of Jobmatch would require a cooperative effort on the part of the various agencies operating in the area of career guidance, training and employment to produce an Irish version of JOBMATCH.

THE ELECTRICITY COUNCIL

Industrial Relations Department

Report on the use of the Job Disposition Questionnaire with Electricity Supply Industry Training Committee apprentices.

Report on the Use of the Job Disposition Questionnaire with Electricity Supply Industry Training Committee apprentices (Phase II)

The Job Disposition Questionnaire (JDQ) was administered to applicants for apprenticeships in 1977. The answers were not considered in the selection process. Those who were accepted and who were still employed three years later completed the questionnaire again at that date. At this time we received, also, the apprentices' scores on their pre-selection tests together with an instructor's assessment on each trainee for Further Education, Practical Skill and Attitude. The instructors' assessments were on a three point scale, those for Further Education and Practical Skill being based on latest examination or test results.

The result of the analysis of the original responses to the JDQ has been reported earlier. This final report is concerned with the data received after the third year. The questions to be answered are:-

1. Does the JDQ predict labour turnover during a three year period?
2. Do the responses to the JDQ change over the three year period?
3. Can the JDQ be of use in predicting achievement?

1. Labour Turnover

Of the 545 starters in 1977, 76 (14%) had left before the end of the third year of apprenticeship. The mean scores of stayers and leavers on the Electrical Apprentice Profile are not significantly different. (Table 1). However, 3.9% of leavers scored 10 or less and only 1.5% of those who stayed scored as low as this. (As reported previously the mean score of those who left during the first year was not different from that of those who stayed.)

2. Change in response pattern to JDQ after three years

In Phase I of this project in which the Electrical Apprentice Profile was formed using fourth year apprentices it was found that the mean score for schoolboys on the profile was 13.1 whilst that for young workers was 14.4. It was therefore to be expected that there would be some increase in the mean scores of apprentices retested after three years. The test/retest mean scores on the Electrical Apprentice Profile of the whole sample and by trade are shown in Table 2, and as expected the mean score is higher on retest. In fact, these latter scores are remarkably similar to those obtained by the established apprentices in Phase I, on whose responses the profiles were formed. When scoring each trade on the seven Placement Profiles it was found that the mean score of the apprentices on their own trade profiles increased on retest whilst their mean score on other trades did not, and in fact it frequently decreased. (This suggests the possibility that a retest on JDQ might be advantageous before trade placement.) One observation on the test/retest results on the Electrical Apprentice Profile is interesting. Of those who were given the best ranking in terms of Attitude*only 21% showed a decrease in their JDQ retest score on this profile whilst of those ranked worst 49% showed a decrease (significance $p = 0.025$ using χ^2 test).

The correlation on Electrical Apprentice Profile of test/retest for the whole sample ($N = 450$) is 0.20 ($p = 0.001$). For Electricians ($N = 195$) and Electrical Fitters (Generating) ($N = 54$) the correlations are 0.23 and 0.39 respectively ($p = 0.002$). With the other trades, the correlations are not significant.

The percentage responses to each question on test and retest are shown in Table 3, even where large changes occur such as 10 and 11, these follow closely the trend of differences in response patterns between schoolboys and young workers. (ITRU publication SL11).

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* Attitude: defined as Motivation, interest and commitment to craft work.

3. Pre-selection test scores in prediction of achievement

Since the ESITC are interested in the JDQ as part of their selection procedures, this section of the report considers the instructors' assessment of achievement in relation to the apprentices' scores at time of selection. They were studied under three headings:

(a) JDQ

(b) Other pre-selection tests

(c) JDQ and other pre-selection tests

Ranking on Attitude is, of course, subjective and the analysis was further hampered because so few apprentices were given the lowest ranking (less than 5%). It was decided to add together the rankings on Further Education, Practical Skill and Attitude to obtain a total assessment for each trainee. Thus those ranked best in all three categories would have a score of three and those ranked worst in all three categories would have a score of nine.

(a) JDQ in relation to instructors' assessments

The total assessment scores were analysed in relation to the trainees' score on the Electrical Apprentice Profile and also on their trade profiles. Study of Tables 4 indicates that trainees in most trades are likely to have a lower assessment in terms of Further Education, Practical Skill and Attitude if they scored low on both the Electrical Apprentice Profile and the trade profiles. The number of trainees in some groups eg. Jointers, Linesmen, Electrical Fitters (Distribution) are too small to be able to consider the relevance of the generalisation to all trades, but it certainly appears to hold good for the Generating Board trades where the group sizes are larger. In view of the fact that these assessments are done by many different instructors whose interpretation of the rankings will inevitably vary, the degree to which scoring on these profiles would help remove some poor trainees with loss of only a few good ones is remarkable.

(b) Other pre-selection tests compared with instructor assessments

As was found in an earlier ITRU study with ESITC apprentices, (ITRU research paper SL10) there is little correlation between pre-selection test results and assessment of third year apprentices. Looking at the whole sample the best correlation is with the National Institute of Industrial Psychology (NIIP) Vincent Mechanical Diagram Test taken by 55 apprentices which gave a correlation of 0.35 with Further Education. The majority of apprentices take the Vernon Ravens Gupta battery where Vernon shows up best in relation to Further Education at 0.13 with a sample of 244. If individual trades are considered other correlations show up where the groups are large enough. (Table 5a and 5b). In view of the small samples of Linesmen and Jointers taking the NIIP tests too much reliance should not be placed on these results.

(c) JDQ and other pre-selection tests in relation to Instructor assessment

A study was undertaken to see if the JDQ could give information to selectors which was not obtained from the conventional test batteries. Those taking NIIP tests were considered separately from those doing Vernon, Ravens and Gupta.

In general terms those scoring a total of less than 50 on the NIIP tests were more likely to obtain a good assessment if they scored high (ie 16 or more) on the Electrical Apprentice Profile. Similarly, by adding together the scores for Vernon, Ravens and Gupta (where all three were available) it was observed that those scoring less than 120 were more frequently assessed well if their Electrical Apprentice Profile score was high (ie 16 or more).

Conclusion

1. As has been found in other projects the JDQ in terms of mean scores is not a good predictor of labour turnover, although really low scorers on the Electrical Apprentice Profile do tend to leave.

The use of the JDQ for discussion at interview could be helpful in terms of particular job requirements eg. working at heights for linesmen and staying in one position for instrument mechanics.

2. An applicant whose score was low on both the Electrical Apprentice Profile and the placement profiles of the trade to which he is allocated is less likely to be assessed as good in terms of Further Education, Practical Skill and Attitude.

3. It would seem advantageous that an Electrical Apprentice Profile score of at least 16 should be expected from applicants whose scores on the conventional test batteries are at the lower end of the acceptable marks.

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